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THE RELATIONSHIP OF UPPER RESPIRATORY AND ALIMENTARY TRACT FLORA TO MASTOID INFECTIONS, WITH PARTICULAR REF- ERENCE TO THE EPIDEMIOLOGY OF MASTOIDITIS.*

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The value of vital and morbid statistics in public health work has been established beyond question. Every governmental agency for the preservation of the public health considers the compilation of such statistics an essential part of its duties.

The information obtained in this way deals principally with communicable diseases. Because of the fact that otitic infections do not come within this classification, practically no statistical data are available in the field of otology. It is true that we know how many patients are operated on for aural lesions and what the usual percentage of fatalities is for certain types of otitic disease; but there are no official statistics dealing with the actual epidemiology of otitis media and mastoiditis.

The same situation obtains, though for different reasons, with respect to the common cold. Although the latter condition is ex-

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tremely communicable, its mild nature has withheld the attention of statisticians from it. Undoubtedly much information of value to otologists is being lost in this way for infections of the upper respiratory tract are the precursors of almost all otitic infections. Furthermore, although the common cold in itself does not produce consequences of any gravity, Shibley, Mills and Dochez have shown that it stimulates any "potential pathogen" that happens to be present in the nose or throat into greatly increased activity; and this symbiosis between the causative agent of the common cold and the pathogenic

BETH ISRAEL HOSPITAL OTOLOGICAL SERVICE OF YEARS 1926 THROUGH 1931.																															
	JAN		FEB		MAR		APR		MAY		JUN		JUL		AUG		SEP		OCT		NOV		DEC		Yearly Totals		Tot. Ac. Chr.	% Mor. fat. Rate			
	R	D	R	D	R	D	R	D	R	D	R	D	R	D	R	D	R	D	R	D	R	D	R	D	R	D					
1926	AO	4	1	1	2	1	2	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	21	1					
	CO	1																													
	AM	4	3	4	13	4	2	4	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	30	1	60					
	CM	1		1			2	1	1		1				2		3	1	2		3	1	2	9	5	13	18	7			
Total	10	4	6	15	7	7	5	5	3	4	2	2	2	2	2	2	2	2	2	2	2	2	2	61	73	6	(9703:2.9)				
1927	AO	2	1	3	1	3															1	1	2	2	14						
	CO					1															1		2	4							
	AM	4	6	5	9	3	2	1		1	1	1	1	1	1	1	1	1	1	1	1	4	3	36	8	50					
	CM	1		1	1	2									1	1	1	1	1	1	1	1	1	10	14	29	3				
Total	7	8	10	12	6	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	6	7	64	8	(9596:2.6)					
1928	AO	3	3	3	1	3				2	1	2									1	1	1		30						
	CO	1	1	1		1				1	1													3	1	6					
	AM	4	7	11	7	4	5	1	1	1	2												3	4	44	4	64				
	CM	4	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	23	4	60	31	5.1			
Total	9	12	15	9	8	5	4	4	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	23	5	(9245:3.7)					
1929	AO	Hospital moved to new quarters				5	4	4	2	2	1										1	1	1	4	34						
	CO					4															3			1	4	5	2				
	AM					2	5	7	1	1	4										3	1	6	13	2	67					
	CM					2															2	1	1	6	10	24	26	4.2			
Total					11	15	9	14	4	6	4	6	4	10		5	1	13	1	9	1	4	21	61	4	(5436:2.7)					
1930	AO	3	3	4	6	6	3	2							2	1	1	2	2					39							
	CO	1			2	5	5	2	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	31	1	81					
	AM	5	10	15	15	19	4	7	3	2	1	4	2	3	1	4	2	3	3	3	3	3	3	93	18	192					
	CM	1	2	8	2	2	4	1	2	3	1	3	1	1	1	1	1	1	1	1	1	1	1	26	3	47	88	8.6			
Total	9	17	29	25	31	10	12	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	169	16	(6391:8.6)					
1931	AO	2	4	4	5	5	4	3													2	2			5						
	CO	1																													
	AM	18	23	33	31	13	15	5	5	7	1	1	4	2	4	2	4	2	4	2	4	2	4	145	5	177					
	CM	6	2	3	3	2	2	3	2	1	1	3	1	1	1	1	1	1	1	1	1	1	1	31	3	36	17	2.3			
Total	27	29	39	40	18	10	13	10	13	10	11	5	9	9	9	9	9	9	9	9	9	9	9	213	5						
Gr Tot	62	74	80	88	51	52	4	33	2	31	5	25	2	32	2	40	2	46	2	703	36										
Acute	43	53	53	52	47	38	2	23	20	4	9	18	25	1	32	1	540	25													
Chronic	19	21	27	36	4	14	2	10	2	11	1	6	1	14	2	15	1	16	1	163	13										
Chr. 30	11	14	13	13	30	34	33	63	47	36	34	25																			
Av Mon	13	10	18	20	14	9	6	5	6	4	5	5	7																		
Inc. 10	13	14	18	11	7	5	4	4	5	5	5	6																			
Mor. R	3.1	6.3	1.6	4.1	5.8	7.1	5.7	14.	7.4	6.	4.8	4.																			

organisms which commonly inhabit the nose and throat is frequently the starting point of serious lesions in the ears.

In the belief that a record of the incidence of, and mortality from, otitic infections would make a valuable contribution to our knowledge of their epidemiology, the following bacteriological and statistical studies have been made. Naturally, we could not carry on this work in terms of the general population; but this condition has been approximated, in a sense, by basing our studies on the total admissions of a general hospital, and not merely on cases on the otological

service. Thus, instead of the incidence of otitic disease among every thousand of the population at large, we have its incidence with respect to all of the patients admitted to Beth Israel Hospital for whatever cause. Our records cover the six years from 1926 through 1931.

Table I gives a picture of the otological service for the six years under discussion. We have divided our cases into four groups: acute otitis media (designated as AO); chronic otitis media (designated as CO); acute mastoiditis (designated as AM); and chronic mastoiditis (designated as CM). The differentiation between acute and chronic cases is based chiefly on the pathological findings at operation taken in connection with the history of the case.

Another classification is on the basis of outcome. The groups that recovered are marked "R"; those that terminated fatally are marked "D."

The records are divided into monthly periods and are based on the dates of admission.

For each year there are the monthly totals of recoveries and deaths and a yearly total, each section carrying out the classification of acute and chronic infections.

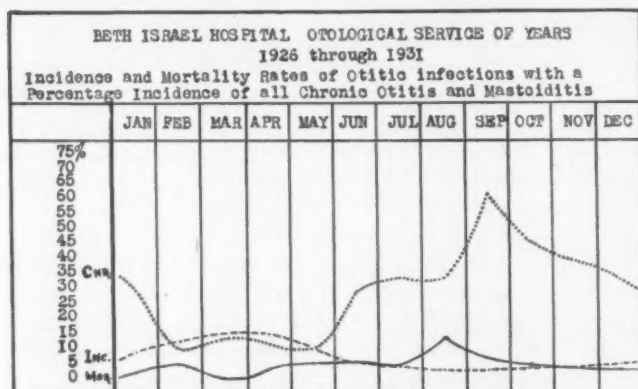
Near the bottom of the table, underneath the figures for 1931, is given the total for each month for the entire six years. From this set of figures we have computed the monthly incidence of all otitic infections for the period under consideration, the monthly mortality rate and the ratio of chronic to acute infections. These findings are illustrated on Graph I, which will be taken up later on.

From the yearly totals we have derived the yearly ratio of chronic to acute infections and the yearly mortality rate, both of which are illustrated further on on Graph II.

In the last column of Table I, the figures in parenthesis show the percentage of otitic infection in relation to the total number of cases admitted to the hospital for all causes. Thus, for the year 1926, there were 2703 admissions, of which 2.9 per cent were otologic cases. Considering that ours is a general hospital, these figures give a fair idea of the yearly frequency of otitic disease. On comparison, it is seen that every three years there is an appreciable increase in the incidence of otitic infections. In the period under discussion these peaks have occurred in the years 1928 and 1931, leading us to think that 1934 may furnish the next period of increased incidence. However, our studies do not cover a sufficient number of years to predict this with any certainty.

We have completed our general survey of the otological service for the six years from 1926 through 1931. Graph I analyzes some of the figures already shown in Table I.

By working out the average number of cases for each month for the past six years, we have traced the incidence of otitic infections throughout a hypothetical average year. This is represented by the broken line on the graph. You will observe a gradual increase, beginning with the winter months of November and December and growing more marked in January and February until the peak of the curve is reached in March and April. Thereafter there is a relatively sharp drop in incidence until August and September, when the lowest point is reached. This finding is not surprising when you consider

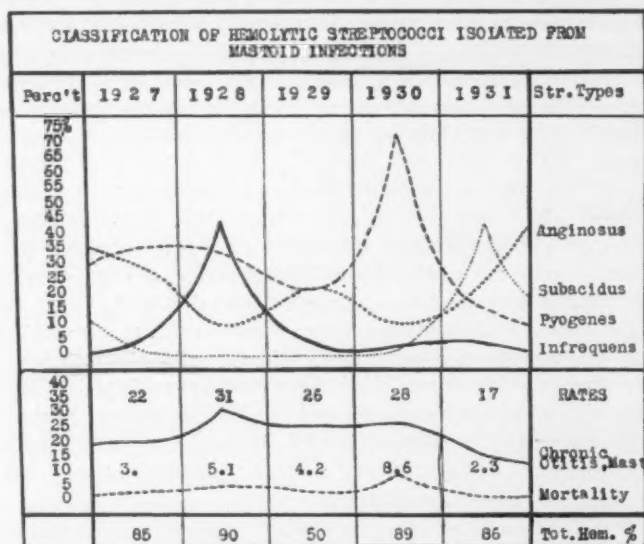


the influence of weather and season on the upper respiratory infections which play such an important etiological rôle in the production of otitic disease.

The course of chronic otitic infections (shown by the dotted line) does not parallel the curve of total incidence. The chronic lesions occur most frequently in summer, when otitic disease in general is at its ebb. It is not easy to provide a convincing explanation of this phenomenon. It may be that chronic lesions which have been started into activity by the respiratory infections of the winter and spring do not come to a head as quickly as acute lesions: the patient, who has been host to the organism for a long time, has developed a degree of immunity to it and the defenses which Nature has built up over a considerable period do not succumb at once. In the same way, it often requires a few months before the chronic lesions that

are the sequelae of the exanthemata of winter and spring reach the stage of hospitalization in an institution for noncontagious disease. However, these are just hypotheses. No certain explanation is at hand. Whatever the cause, it appears that the chronic lesions succeed the acute ones.

Finally, the mortality rate (represented by the continuous line), which is shown on the last line of Table I to average about 5 per cent, stays around this figure until the peak of general incidence has been reached in March and April. Then, when the general incidence starts to drop, the mortality rate begins to rise, reaching its peak in August, when the general incidence is at its lowest. In other words,



we have the strange spectacle of the highest mortality rate occurring during the period of lowest incidence. From the fact that the mortality curve almost parallels the chronicity curve, the peak of the former preceding that of the latter by just a month, one might be led to assume that the increase in chronic lesions is responsible for the increase in mortality. However, on analyzing the figures in Table I, no such relationship is found to exist; and we are forced to conclude that we are confronted with a phenomenon that is common to all epidemics; namely, toward the end of the epidemic the ratio of mortality to morbidity shifts in favor of mortality.

It will be remembered that in the discussion of Table I attention was directed to the yearly variations in the mortality rate and the ratio of acute to chronic infections. These relationships may be studied more closely on Graph II.

At the bottom of Graph II, the broken line which represents the mortality rate rises gradually from the year 1927 to 1929. In 1930, the rise is more abrupt, nearly doubling the average mortality rate of the previous three years. Then we have an equally abrupt fall to subnormal figures in 1931.

What is the reason for the high mortality of 1930? Study of the differential curve between acute and chronic lesions does not throw any light on the cause. If acute lesions were responsible for the greatest percentage of deaths, 1931 should have had the highest mortality and 1928 the lowest. Instead, we have an average mortality for 1928 and an unusually low one for 1931. Conversely, if chronic lesions were the responsible factor, we should have had our highest mortality in 1928, which, as has already been stated, showed an average rate.

It is true that the mastoid infections of 1930 were of unusual severity, with many serious complications like sinus thrombosis, meningitis and brain abscess, but this does not answer our question: it merely puts it in another form. Why, in the year 1930, were the infections so severe and cases so prone to complication?

The specific etiology of mastoiditis affords no clue to our problem. In 1930, 89 per cent of our mastoid infections yielded a pure hemolytic streptococcic culture; about 5 per cent were mixed infections (staphylococci and streptococci) and the balance were of pneumococcic origin, pneumococcus Type III having been classified under streptococci. These figures do not differ in any material respect from the other years under consideration.

Having exhausted all other possibilities, it occurred to us that we might be dealing with biologically different, although morphologically identical, streptococci, and that here might lie the explanation of our problem. Bacteriologists have long suspected the heterogeneity of the streptococcus group: they have differentiated the hemolytic types from the viridans and indifferent forms and have attributed most of the acute pyogenic infections to the hemolytic group. Nevertheless, although acute hemolytic infections take a high toll of life, in our studies, as has already been stated, we could not demonstrate a correlation between this factor and the mortality rate. The mortality rate and the percentage of hemolytic infections failed to run parallel to each other. The high mortality rate of 8.6 per cent in

1930 occurred with 89 per cent hemolytic infections, while a hemolytic incidence of 90 per cent in 1928 gave only 5.1 per cent deaths. With hemolytic infections reaching only 50 per cent in 1929, the death rate was 4.2 per cent, while the lowest mortality figures of all—2.3 per cent in 1931—occurred in the presence of 86 per cent hemolytic infections. If the differentiation of streptococci is to answer our question, we must therefore proceed along other lines.

In the last decade, bacteriologists have differentiated streptococci by testing their sugar-fermenting properties. The details of this work are beyond the scope of this paper. Suffice it to say that nutrient broth is inoculated with a swab dipped in the infected mastoid area at operation. After 24 hours, a loopful of the growth obtained in this way is smeared on a nutrient agar blood plate to determine the hemolytic value. At the same time media are inoculated also with the differential sugars of the Holman classification. Results are classified according to the hemolytic and the sugar-fermenting properties of the organism. The upper half of Graph II shows the findings we have obtained in the six years from 1926 to 1931. In this graph we are considering only the hemolytic streptococcus as this group constitutes the great majority of otitic infections. We shall take up the nonhemolytic viridans and indifferent forms further on.

Reviewing the Holman nomenclature, which we employ, in the hemolytic group we encounter eight types of streptococci. The arrangement given herein is based on characteristic clinical features and is therefore of considerable importance as a diagnostic guide, as we shall see shortly.

1. *Streptococcus anginosus*, the commonest of the group, occurs mostly on the mucous surface of the exposed air passages.
2. *Streptococcus pyogenes*, the next commonest type, occurs in deep-seated abscesses, such as tonsillar and retropharyngeal abscesses, cervical adenitis, empyema, peritonitis, salpingitis, etc.
3. *Streptococcus infrequens*, as the name implies, is not so commonly found, as it shows a selectivity for closed sacs like chronic granulating sinus infections, periapical abscesses, enteric ulcerations and genitourinary infections.
4. *Streptococcus subacidus* is still an undifferentiated type. Sometimes it behaves like *anginosus* and at other times like *pyogenes*.
5. *Streptococcus equi* acts clinically like the *pyogenes* group and is therefore classed with it.

Six, seven and eight are three very uncommon hemolytic types. Usually they act like *infrequens* and are therefore grouped with it.

Since 1927, and especially in 1929, 1930 and 1931, we have carefully studied the yearly occurrence of these streptococci in pyogenic lesions. Our findings in mastoid infections are given on the upper portion of Graph II. According to the curves shown thereon, we may call 1928 an outstandingly *infrequens* year, 1930 a *pyogenes* year, and 1931 a *subacidus* year. We have ventured to predict that 1932 will be an *anginosus* year, and so far our records have confirmed our expectations.

On comparing the upper and lower halves of Graph II, we make a very significant observation—and that is the almost perfect parallelism between the *pyogenes* and mortality curves. With some slight variation for the first three years, both curves attain their peak in 1930. In 1931, a year later, both are at their nadir. It is not hard to establish a causal relationship between the two. Bacteriologically, streptococcus hemolyticus *pyogenes* is a highly virulent organism. The infections to which it gives rise run an acute, septic course: and if the resistance of the tissues is not sufficient to localize it completely, it may form metastatic foci, through both the blood and lymph channels. Metastatic abscesses in muscle sheaths, sinus thrombosis, meningeal infections and even brain abscesses are not uncommon complications of a *pyogenes* infection of the mastoid. With these facts in mind, it is easier to understand the high mortality of 1930 and the very low mortality of 1931.

This is not the only striking parallelism between the upper and the lower curves on Graph II. Study the *infrequens* curve in relation to the chronicity curve and observe the analogy between them. This, too, is explicable in terms of the clinical characteristics of the organism. Streptococcus *infrequens* is a highly developed micro-organism. During the acute phase of an infection it is pyogenic; but, due to the wide range of its metabolic functions, it manifests an unusual indifference to the environmental protective forces of its host and can survive in an infected focus in symbiosis with other parasites as well as saprophytes. A tendency to chronicity is therefore the outstanding feature of *infrequens* infections.

The remaining two curves in the upper section, those of *anginosus* and *subacidus*, show no apparent relationship to either the chronicity or the mortality curve. Both streptococcus *anginosus* and streptococcus *subacidus* are commonly encountered on the mucous surfaces of the upper air passages. The infections from which they can be recovered are usually markedly acute, hemorrhagic and at times even necrotic. Usually they run a brief, self-limited course with an insignificant percentage of mortality. This is especially true of strep-

tococcus anginosus. Streptococcus subacidus, however, is an undifferentiated type. Usually it behaves like anginosus but at times it partakes of the symptomatology of pyogenes and then it is highly pathogenic.

Table II furnishes a brief résumé of this study. In it we compare 1930 and 1931, the years of highest and lowest mortality, respectively. The first column for each year gives the number of cases for each type of infection; the second gives the percentage of incidence for each type. Columns 3, 4 and 5 show the most commonly fatal complications, and the last column the number of fatalities.

OTITIS and MASTOIDITIS	1930						1931					
	Cases	Percent Age	Sinus Thromb.	Meningeal Brain Abscess	Patal Cases		Cases	Percent Age	Sinus Thromb.	Meningeal Brain Abscess	Patal Cases	
Infrequens Fecalis	6	7					4	3				
	1	1										
Pyogenes Mitis	7	8	1	.	.		4	3	.	.	.	.
	54	60					24	20				
Anginosus Salivarius	4	4					1	1				
	58	64	10	4	7	20	25	21	3	2	.	1
Subacidus Ignavus	15	16					22	18				
	6	7					4	3				
Str. Muc. Cap. Pneumococ.	21	23	.	.	.	.	26	21	.	.	.	.
	.	.					54	45				
Str. Muc. Cap. Pneumococ.	.	.	.	.	.	.	6	5				
	4	4					60	50	3	1	.	3
Grand Totals	1	1					5	4				
	5	5	1	2	3	3	2	1				
Grand Totals	91	100	12	16	10	23	7	5	.	3	.	3

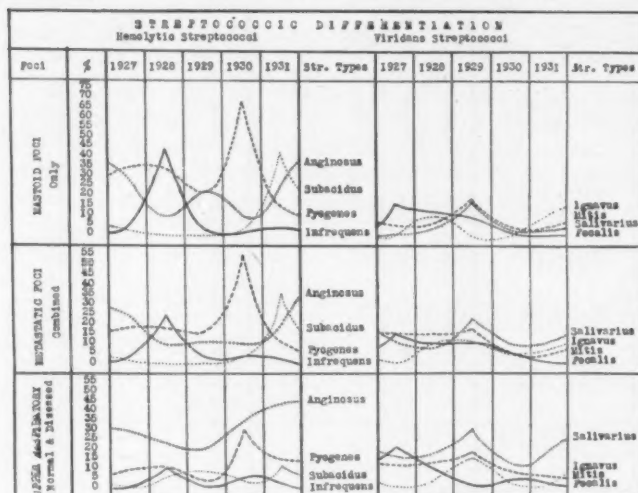
In 1930, 91 cases were studied bacteriologically. Of these, 58, or 64 per cent, were of the pyogenes type; 21, or 23 per cent, fell in the anginosus group, and 7, or 8 per cent, were infrequens infections. The pneumococcus group, including streptococcus mucosus capsulatus, was represented to the usual extent of 5 per cent. Practically all fatal complications occurred in the pyogenes and mucosus capsulatus groups. Thus, out of 23 deaths, 20 were in pyogenes cases and three in mucosus infections.

In 1931, 122 cases were studied with the following distribution: 50 per cent subacidus, 21 per cent pyogenes, 21 per cent anginosus,

3 per cent infrequens and 5 per cent pneumococcus. Again, though to a lesser degree, the fatal complications were a feature of the pyogenes cases. The subacidus group was next in the number of complications, but with a mortality distinctly less than that of pyogenes in 1930. The pneumococcus group was represented in practically the same manner as the year before.

The Relationship to Other Pyogenic Infections: the Course of Otitic Infections:

At this stage of our study the question naturally arises whether this yearly typical variation of streptococci is characteristic of otitic infections only. The answer is "no." It is true that there is a certain degree of focal selectivity among highly differentiated, though



not necessarily highly virulent, streptococci; but in general, taking all pyogenic infections together as we encounter them in a general hospital, we find the same variations occurring—and occurring in the same years—as in the case of mastoiditis. Graph III illustrates this.

The top square on the left side is a reproduction of Graph II, showing the yearly variation of type among streptococci in mastoid infections. Immediately underneath this are illustrated the variations for all other metastatic foci from which streptococci have been isolated. In this group we have included such conditions as pleuritis, peritonitis, lung and liver abscesses, perinephritic abscess, pyelitis,

cystitis, prostatitis, cervical and inguinal adenitis, meningitis, brain abscess and blood stream infections. When the curve for each streptococcal type is studied on these two charts, we observe a striking similarity in the yearly variation. The curve for each type, both in mastoidal infections and in the other foci considered, reaches its peak and its lowest point respectively in the same years. There is a difference of intensity but no more than is permissible in an experimental study.

Assuming that there exists a uniform yearly distribution of certain streptococcal types in many diseased centers which are really metastatic foci originating in a common source, with the information at our command it is relatively easy to locate that source. Taking the symptomatology of otitis media and mastoiditis as our guide, let us turn our attention to the upper respiratory and alimentary tracts. The bottom square on the left side of Graph III corroborates our suspicions. The curves for *pyogenes*, *subacidus* and *infrequens* in the upper respiratory tract, within the limits of experimentation, almost parallel the curves for those organisms in the metastatic foci. In the case of *anginosus* there is some irregularity for the year 1930: but otherwise the same parallelism exists.

Till now we have purposely avoided discussion of the viridans and other nonhemolytic streptococcal flora occurring in mastoid infections. For one thing, the nonhemolytic streptococcus is not so frequently found in otitic disease. For another, the working factors to be considered in the analysis of experimental data are different with these organisms.

The right half of Graph III gives the yearly distribution of the viridans and indifferent forms of streptococci for each of the foci we have been considering and in the same order. To make comparison easy, we have used the same line for the same sugar fermenters in the nonhemolytic class as in the hemolytic. Thus streptococcus *fecalis* in the viridans group is comparable to streptococcus *infrequens* in the hemolytic; *salivarius* may be likened to *anginosus*, *pyogenes* to *mitis* and *ignavus* to *subacidus*.

As with the hemolytic streptococci, the curves of the viridans group show certain conspicuous peaks. There is a notable similarity between these peaks as they occur in the hemolytic class and as they occur in the viridans in the respective subtypes with the same sugar-fermenting properties. As with the hemolytic streptococci, the general course of the curve for each of the nonhemolytic types is conspicuously uniform in the different foci considered. In other words, in spite of the differentiation which is now made between the hemo-

lytic streptococci and the viridans forms, there is a striking similarity between the same sugar-fermenters in both groups.

There is one outstanding variance between the hemolytic and the viridans groups that affords grounds for interesting speculation. In all three foci streptococcus fecalis attained its peak in 1927, while streptococcus infrequens, the corresponding type in the hemolytic class, did not reach its peak till 1928. Similarly, the crest of the nonhemolytic streptococcus mitis was reached in 1929 and that of the hemolyzing streptococcus pyogenes in 1930. In other words, the peaks of the viridans curves precede by a whole year the corresponding peaks of the hemolytic types; and this is true of all foci, normal as well as diseased.

What does this indicate? Although our studies do not at this stage permit us to draw final conclusions, certain possibilities naturally suggest themselves to us. Is it not conceivable that the hemolytic power of the streptococcus is a changing phase, subject to the influence of climate, environment and immunological factors, while the sugar reactions have as their basis a definite, constant metabolic function? If this is so, we can envisage a gradual change from the viridans to the hemolytic type, brought about by the continual working of the factors we have enumerated for a period of a year, while the sugar-fermenting properties of the organism remain constant. While we can offer no proof of this hypothesis, it provides a logical interpretation of the data presented herein and is the chief practical inference that may be drawn from our study.

SUMMARY AND CONCLUSIONS.

1. It has been stated that the subculture of bacterial flora in otitic infections is of no practical value. This is true if it is done haphazardly and in occasional cases. On the other hand, if subcultures are done systematically and as a routine matter in all cases, interesting data are obtained that have a genuine prognostic value and, in obscure or borderline cases, may help to decide therapy. The study presented here is based on the total admissions to Beth Israel Hospital, for all causes, for the six years from 1926 to 1931 inclusive.

2. We have found an appreciable increase in the incidence of otitic infections every three years. These infections start in November and December, increase gradually in January and February, and reach their maximum in March and April, declining sharply thereafter until their minimum is reached in August and September. The chronic infections follow the acute ones, reaching their maximum in the summer and early fall when the general incidence is at its lowest.

3. The mortality rate is highest in the summer, when the general incidence is lowest. The ratio of acute to chronic cases does not explain this. Rather does it appear to be the usual reversal of the relationship of morbidity to mortality, in favor of the latter, which is seen at the end of every epidemic.

4. The yearly mortality rate is not constant. The average for the six years covered by our study was 5 per cent. The highest mortality was 8.6 per cent in 1930, the lowest 2.3 per cent in 1931.

5. While the streptococcus hemolyticus was found to be the infecting agent in about 90 per cent of all cases, its presence did not explain the variations in mortality, and a further differentiation of streptococci was sought to determine the responsible factors. Using Holman's sugar differential technique and classifying the organisms present on the basis of their sugar-fermenting as well as hemolytic properties, we found streptococcus pyogenes to be the cause of almost 80 per cent of the mortality from mastoid infections. Streptococcus infrequens was the type most frequently encountered in chronic mastoiditis.

6. Study of the yearly variations of the streptococcic types in mastoiditis revealed an orderly sequence in their periodicity suggestive of recurring cyclic changes. We believe that a major cycle embraces five to six years. According to our findings, 1927 was a type-indifferent year, 1928 an infrequens year, 1929 again an indifferent year, 1930 a pre-eminently pyogenes year and 1931 a subacidus year. In the fall of 1931 we ventured to predict the type of 1932 as anginosus, and our records to date substantiate this. The existence of such a cyclic change in streptococcic types is borne out by the findings for all other metastatic foci as well as otitic infections. The parallelism between the graphic curves for mastoiditis, for other diseased centers and for the exposed mucosa of the upper respiratory and alimentary tracts strongly prompts the inference that the last named may be the major source of all metastatic infections.

7. The fact that certain viridans types of streptococci were regularly the precursors of hemolytic types with the same sugar-fermenting properties suggests the possibility that viridans forms may change into hemolytic types. The time element required to bring about such an alteration appears to be a year.

Further observations will be carried on.

MARKED DEAFNESS AND MULTIPLE HEAD INJURIES.*

DR. PHILIP S. STOUT, Philadelphia.

That fractures of the base of the skull involving the petrous portion of the temporal bone frequently cause unilateral or bilateral deafness is well known. That fractures at the base, not involving the petrous portion, and sometimes fractures of the skull some distance from the temporal bones may at times cause deafness in one or both ears, at least for some time, is also well known. But that head injuries, single or repeated, without necessarily fracturing the skull, may be followed by deafness is still a moot question and it will only be by reporting all cases that have deafness following injury of the head or other parts in a complete, impartial statement of facts, without bias, that we will be able to evaluate the findings and ultimately come to some conclusions. It is wrong to say that no deafness follows any head or other injury except fracture of the skull and it is also wrong to attribute any or all deafness that a person may have to some previous injury or injuries.

Considerable interest is manifesting itself in otologic findings in head trauma. Recently observations by Mygind (Copenhagen), 142 cases; *Annals O., R. and L.*, Grove (Milwaukee), 275 cases; *A. M. A. Jour.*, Glaser and Shafer (Los Angeles), 250 cases; and others have appeared and they have discussed the various phases quite fully. It would be well for every head injury brought into the hospital or treated outside to receive a thorough otological and vestibular examination at the time and follow up to see if there is improvement or otherwise in the manifestations.

With this thought in mind, I am presenting this case to you this evening: Howard B. B., age 65 years, American; occupation, railroad brakeman, later clerk. Chief complaint: Deafness.

Family History: Father died at age of 75 years, no deafness; in fact, going back for generations, no deafness of anyone in his family. Mother died at age of 64 years, no deafness, and no deafness in her family. Had one brother who died in infancy.

Marital History: Married first time in 1898 at age of 31 years; no children. Married second time in 1904 at age of 37 years; no children.

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Previous Illness: Had no illnesses in childhood that, as far as he knows, affected his hearing. Never had running ears. Did not have scarlet fever or measles. Had some nose bleed in childhood, which was cured by powwowing. Malaria at age of 17 years, in Bay Ridge, Md. Was quite ill. Probably had some cinchona preparation or quinin in treatment. Had typhoid, light case at age of 19 years, in Philadelphia. Did not have meningeal symptoms. Had uremic symptoms in 1911 at age of 44 years; was sick two months. No venereal diseases; has lived a clean life.

Present Illness: 1932, deafness in both ears for a long time. No noticeable deafness at the time of second marriage, although one year later, 1905, age 38 years, noticed some difficulty with the telephone. From then on he became more deaf, both ears. I saw him first in 1911, age 56 years; his hearing was impaired then and getting progressively worse.

Examination: Eardrum intact, thickened, slightly retracted, no cone of light, other landmarks easily made out. Hearing: Bilateral deafness very marked. Rinne: Bilateral, negative. Schwabach: Greatly shortened air and bone, although bone apparently much longer in proportion because he hardly hears the fork at all by air conduction. Weber: Not lateralized. Caloric test shows about average response to cold water, using 50 c.c. Audiometer tests show on the right he hears only from 256 to 2048, with about 70 per cent loss. Left ear, 128 to 1024 with about the same amount of loss, although he thinks he hears better with the right ear. Voice. Only loud talking near ear. Whisper: Not heard at all. Tonsils not removed. Nostrils fairly free. Slight sinus disease.

Laboratory Tests: Urine: slight trace of albumin, few casts, otherwise negative. Blood pressure, 155/110. Wassermann, negative.

Employed on the railroad for forty-two years, as brakeman and then as clerk, working on night shift for twenty-seven years under conditions which were not very healthy. The office was an old railroad coach placed alongside the railroad tracks, damp and cold in winter, badly ventilated and poorly heated. It was near the Schuylkill River, much fog and chill at night.

History of Accidents: 1. Age 10 years, 1877: Seesawing with board over fence on edge of roof, fell 15 feet, no special injury; shaken up.

2. Age 16 years, 1883: Fell on ice on point of another's skates, struck in back of head; first head injury.

3. Age 17 years, 1884: Was working in cupola of a new four-story hotel in Asbury Park, wind storm blew him off with cupola to the ground, no special injuries; shaken up.

4. Age 18 years, 1885: Fell from ladder nearly 100 feet, struck head, was unconscious for some time; second head injury.

5. Age 24 years, 1891: Knocked from train using brake wheel, overhead bridge struck back of his head and knocked him to the ground, where he also landed on his head. Was dazed. Did not lay up, was stiff for a few days, however; Third head injury. Head struck twice.

6. Age 25 years, March 2, 1892: Had left hand crushed and lost three fingers. Taken to the Presbyterian Hospital. Had two operations. Dr. J. E. James performed a third operation on the same hand. Somewhat nerve-racking experience.

7. Age 26 years, 1893: Had six ribs broken and left collar bone broken by being squeezed between two cars while changing a link for a low to high bullnose, accident caused by another brakeman giving the signal to push the train back while he was between the cars.

8. Age 27 years, 1894: While walking over the coal in the coal train, as brakeman, slipped and fell off, his head struck the ground.

9. Age 28 years, 1895: Had left leg broken while getting off the train, caused by stepping on a piece of coal, which threw him to the ground, causing fracture and considerable shaking up. Head was jarred. Fifth head injury.

10. Age 28 years, 1895: While on crutches the crutches caught on lamb's wool rug at head of stairs, left leg was in cast, fell forward down the stairs and knocked off the newel post at the bottom and the leg and cast went several inches into a partition. Sixth head injury.

11. Age 31 years, 1898: Lost his left foot at Rope Ferry Road Victoria scales caused by brakeshaft breaking and falling under the moving cars, struck head but was not unconscious. Was greatly shocked by narrow escape from death. Seventh head injury.

12. Age 38 years, 1905: Had three ribs broken on railroad by car pushing him under another car. Pay car pushed into crowd of working men, was nearly killed. Was greatly excited over this accident.

13. Age 46 years, 1913: Was struck by an auto, injury to left leg and left elbow and general shake-up. Elbow operated on by Dr. John B. Deaver.

14. Age 64 years, March, 1931: While cleaning top of railroad lockers stepped on a banana peel, slipped and fell six feet to the floor on his head, cut right eye and top of head. Eighth head injury.

15. Age 64 years, October, 1931: While waiting for a freight train to go by at Absecon Station, traveling at about 60 miles an hour, he and his wife stepped into the waiting room. The train seemed quite long so he put his head out of the door, when a large piece of coal flew from the coal cars and struck him on the head. He was stunned and had a number of stitches in his scalp. Ninth head injury.

Here we have a man, very deaf, with seven distinct head injuries before he or others noticed any marked change in his hearing. He was then about 38 years old. He had already gone through a malaria illness with the usual treatment for the same. He had been exposed to all kinds of weather and later was exposed to most unhealthy working conditions in an old railroad car made into an office. He has had some renal conditions. He had in addition to nine head injuries six other accidents that were nerve-racking. Hereditary deafness may be ruled out.

These are the facts; draw your own conclusions as to what was the main cause or causes for his present deafness. To me the several factors must be considered. The head injuries with the rest. Presentation of patient.

269 South 19th Street.

ATYPICAL MASTOIDITIS—CASE REPORT.*

DR. JOHN D. SINGLETON, Philadelphia.

This is the report of a case of atypical mastoiditis that entered the Graduate Hospital, Philadelphia, Dec. 11, 1931. The patient first came to the accident ward; was sent from there to the Coates Clinic, where she was seen by Dr. William Gordon and myself. Some unusual features presented by the patient merit the reporting of this case.

Patient, V. F., female, colored, age 50 years, married, came to the hospital complaining of pain and swelling behind the right ear, swelling of the upper portion of the right side of the face, and discharge from the right external canal.

History: The family and past history were irrelevant. The present complaint started about two months before the patient entered the hospital. At that time she had a slight cold that lasted for two or three days. About three days following the onset of the cold she felt a pain in the right ear and behind the ear. This pain was described as sharp and shooting in character and was worse at night. It radiated to the right temporal, parietal and occipital regions of the head, and lasted for a period of about three weeks. The pain then changed from the sharp, shooting type to a constant, dull, aching, boring pain, which was confined to the right mastoid region. After this latter pain had continued for about three weeks, six weeks from the initial onset, the patient noticed some swelling behind the involved ear. About three days after the appearance of the swelling, a thick yellow discharge was observed coming from the right external canal and was continuous thereafter. On Dec. 10, 1931, two months after the initial onset of symptoms, the right side of the patient's face became swollen, and as a result of this swelling she decided to seek medical aid.

On examination, the tissues behind the right ear were edematous and there was some fluctuation. The area was slightly tender. There was considerable swelling present over the upper portion of the right side of the face. The external canal was filled with thick yellow pus. On making firm pressure over the antrum, about 2 or 3 c.c. of pus literally flowed from the canal. On the posterior wall, about 1 c.m. external to the tympanic membrane, a small, cone-shaped, papillary-like projection was seen protruding into the canal. Pressure was

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again made over the antrum, and pus was seen to flow from the free end of this projection into the external canal. The tympanic membrane showed some loss of lustre, was slightly reddened in its upper portion, but showed no bulging or perforation. Examination of the nose and throat showed a mucopurulent discharge on the right side of the nose posteriorly between the septum and middle turbinate. The left side was clear. The tonsils were cryptic and slightly enlarged. There was some congestion of the pharyngeal wall.

The patient was admitted to the hospital on the service of Dr. George M. Coates for further study and treatment. On admission her temperature was 98.6°, pulse 84, respiration 20. The blood count showed 5,780,000 red cells, 75 per cent hemoglobin; leukocytes, 6,700; 62 per cent polys.; 35 per cent lymphs.; 2 per cent eosinophils, and 1 per cent monocytes. The urine was negative.

An X-ray picture of the mastoids showed the left mastoid clear. The right mastoid was reported as follows: "Subacute suppurative mastoiditis with abscess about 2 c.m. in diameter present just below the knee of the sinus and extending down toward the tip." On the strength of the X-ray and clinical findings, we decided to operate on the mastoid. The patient was operated upon Dec. 11, 1931, at 9:15 p. m. under ether anesthesia.

Operative Findings: The usual mastoid incision was made, and the overlying soft tissues were found to be very edematous and thickened. A subperiosteal abscess with perforation of the cortex over the antrum was found. The mastoid cells were broken down, and the cavity was filled with pus and granulations. There was a fistula through the posterior bony canal wall connecting the mastoid cavity with the external auditory canal. The lateral sinus was found exposed over a large area, was covered with granulations, but it did not appear thrombosed. The mastoid cavity was thoroughly cleansed to healthy hard bone, and most of the posterior bony canal wall was removed. The wound cavity was flushed out with warm bichlorid of mercury solution 1-10000. The antrum and mastoid were packed lightly with one-half-inch iodoform gauze, and the gauze brought out at the lower end of the incision. The wound was then sutured. The tympanic membrane was not incised. The external canal was packed tightly with one-half-inch iodoform gauze, and the wound was dressed with a wet 1-10000 bichlorid of mercury dressing.

Following the operation the wound was dressed daily with sterile dry dressings until the patient was discharged. At the first dressing after the operation, the packing was removed from the external canal and the canal repacked. At this time a portion of the packing was

removed from the mastoid wound. On the second day following the operation, the packing was removed from the external canal and the canal left open. There was moderate drainage present. Two of the sutures were removed at this time. On the fourth day the remaining sutures and packings were removed. There was some decrease in the drainage at this time. On the sixth day the discharge was very slight, and the patient was allowed out of bed. On the second day following the operation the patient's temperature reached 100.4°, but thereafter it never went above 99.8°. When the packing was removed from the wound the temperature dropped to normal and remained there.

The patient was discharged nine days after the operation with primary healing of the wound and without drainage. Two weeks after the operation, she reported back to the clinic with fluctuation over the right antral region. The area was cleansed with alcohol, opened with a small hemostat, and about two drams of clear, straw-colored fluid evacuated. The wound then drained for two or three days, healed and has been perfectly dry until the present time.

An audiogram taken Jan. 29, 1932, seven weeks after the operation, showed a slight hearing loss in both ears. The hearing was about 5 per cent less on the operated side for the low frequency sounds. It was peculiar to note that the loss for the high frequency sounds was approximately 40 per cent greater on the affected side.

The unusual features of this case were: 1. The absence of a demonstrable otitis media. 2. The complete breaking down of the mastoid cells with perforation into the external auditory canal, avoiding the middle ear. 3. The large spontaneous exposure of the lateral sinus, indicating the extensive necrosis with only slight discomfort to the patient.

A review of the literature reveals that a number of similar cases of so-called primary mastoiditis have been reported. Hemstead¹⁻², of the Mayo Clinic, reported six cases in 1926. He stated that thirty-two cases had been reported in the American and English literature since 1915. Quoting from Hemstead, Dabney made a careful review of the literature in 1915, found twenty-four cases reported and added two of his own. Heterick³, of New York City, reported four cases in January, 1928, and reviewed forty-eight cases. Ersner⁴, of this city, reported a case in 1922. Richie⁵, reported a case in 1921. King⁶ reported a case in 1923.

In reading the literature on the subject of atypical mastoiditis, I have noted several points of interest: 1. That these cases are seldom diagnosed before the appearance of some complication. 2. That com-

plications occur with great frequency. 3. That the complications are rarely fatal. 4. That recovery after operation is quite rapid in most cases.

Failure to make an early diagnosis in these cases can be explained in part by the fact that many of them are not seen by a competent otologist until some complication has developed. Another reason for failure is that we may be prone to forget the possibility of mastoiditis in the absence of middle ear suppuration.

In the forty-eight cases reviewed by Heterick, thirty-seven were complicated. Perforation of the cortex with subperiosteal abscess, and perisinus and extradural abscesses were the most common complications encountered. Long⁷ reported a case of "Acute Suppurating Mastoiditis Without Tympanitis; Peri-Sinus Abscess, Phlebitis Streptococcemia, Operation, Recovery." Mollison⁸ reported two cases of "Lateral Sinus Thrombosis Without Otorrhea." The only fatal case I found recorded was reported by Bennett⁹ as a case of "Symptomless Mastoiditis Followed by Meningitis and Death."

Recovery following operation was rapid and uneventful in almost every case. The case reported by Long was discharged from the hospital twenty-three days after the operation. This was the longest recovery period of the group.

Comment: I feel that otologists should ever bear in mind the fact that mastoiditis without otorrhea does occur, and that all cases complaining of continued, constant or recurrent pain in or about the ear should be given the benefit of a comprehensive study, including repeated otologic and X-ray examinations.

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Graduate Hospital.

SINUSITIS IN CHRONIC ARTHRITIS.*

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DR. CORNELIUS TRAEGER,
New York

The present report covers a five-year period of study from 1926 to 1931. A detailed stereoscopic Roentgenologic study of the sinuses was made routinely in 386 cases of chronic arthritis seen in office practice in New York City. From the combined clinical and Roentgenologic study of these cases the writers have become convinced that paranasal sinusitis played a most important rôle in the onset, progress and prognosis of the arthritis of many of their cases.

The marked divergence of opinion, held by various writers in different sections of the country, as to the etiologic significance of sinusitis in chronic arthritis is perhaps due to failure to appreciate that in chronic arthritis the etiologic factors may vary in importance in different groups of cases or in similar groups from different parts of the country. Groups of cases used for clinical study may differ widely as to age, economic status, race, physique and previous or concomitant diseases. There are many cases of paranasal sinusitis in which arthritis never develops. But there are also many individuals who for years harbor dental, tonsillar, prostatic and other infectious processes who do not develop arthritis. Probably the majority of individuals who harbor a single focus of infection such as sinusitis, or tonsillitis, or prostatitis, or a dental abscess, whose general resistance is good, are able to ward off the effects of infection and do not develop arthritis. On the other hand, it cannot be denied that there may be individuals with a low resistance in whom a sinus or any other focal infection may act as the etiologic factor in the production of chronic arthritis.

In order to demonstrate clinically the relationship of sinusitis to chronic arthritis it is necessary not only to show a large incidence of sinusitis in chronic arthritis cases but to show also the improvement or cure of the arthritis following treatment of the sinuses. On this basis the present writers have come to the conclusion that sinusitis is a very important factor in many cases of chronic arthritis, because in 386 consecutive cases of chronic arthritis they found that 93 cases or practically one out of every four patients had Roentgenologically

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and clinically proven sinusitis, most frequently of an asymptomatic or "silent" type. Of these 93 patients, 51 received rhinologic treatment, of conservative or radical nature. The arthritis of these 51 patients showed with few exceptions a most favorable response to the rhinologic treatment of the diseased sinuses.

The present routine study of the sinuses in chronic arthritis cases was prompted by the discovery five-and-one-half years ago that chronic sinusitis may exist in an arthritis patient in silent form, unsuspected by the patient or his physician, and that the arthritic

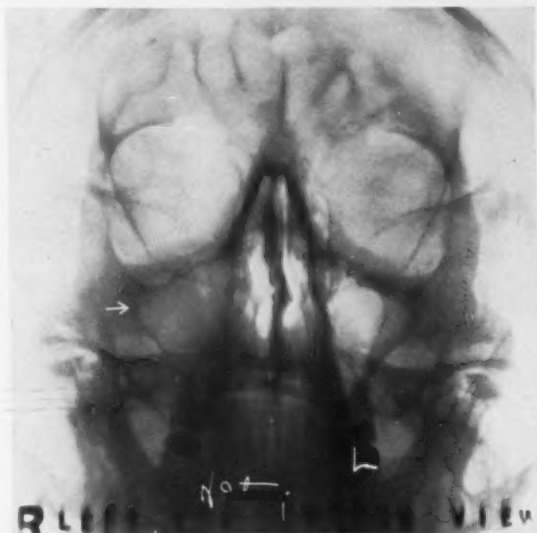


FIG. 1. Roentgenogram showing marked cloudiness of the right antrum. Chronic arthritis of three years' duration. Teaspoonful of mucous material removed from antrum. Marked improvement following conservative rhinologic treatment.

condition of such patient may be considerably improved by sinus treatment.

The information obtained from this study can be divided roughly into two classes: 1. that which deals with the purely technical phases and difficulties of sinus Roentgenography, and 2. that which deals with the clinical and Roentgenologic search for evidence of sinus infection. These will now be discussed at greater length.

1. Technical difficulties of sinus Roentgenography.

A detailed technical discussion of all the possible technical errors in sinus Roentgenography would be out of place here. Reference must be made, however, to a few factors which are the essentials of diagnostic sinus Roentgenograms, and which should be understood by the rhinologist and clinician.

a. The films must exhibit the greatest possible contrast between the air-containing sinuses and their surrounding structures. It is this quality which determines to a large extent the diagnostic value of the nasal sinus Roentgenogram. A slight technical error may

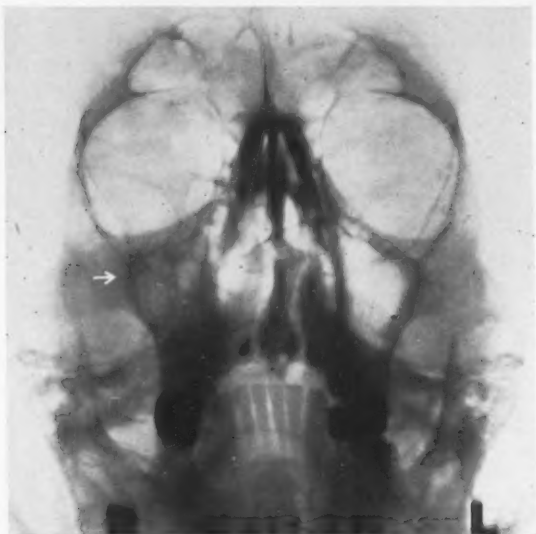


Fig. 2. Roentgenogram showing marked cloudiness of right antrum. Antrum contained pus. Chronic arthritis of two years' duration. Marked improvement following antral irrigations.

destroy this quality in the film and hence destroy the Roentgenologic evidence of disease in a sinus.

b. On account of the marked complexity of the cranial structures and the complicated anatomic relationships of the nasal sinuses, stereoscopic films are of great importance in the Roentgenologic study of the anatomy and pathologic changes in the sinuses. Stereoscopic films enable the observer to eliminate confusing superimposed shadows of the cranial structures which are often so puzzling in the "flat" film.

c. The sinuses should be radiographed in four or five positions, so as to show clearly every sinus. One must guard against superimposition of sinus shadows upon each other and of extraneous structures upon the sinuses.

These in brief are the technical pitfalls of sinus Roentgenography.

2. The clinical search for evidence of sinus disease in chronic arthritis revealed the following groups of cases.

a. In a certain number of cases the history indicated clearly the presence of sinusitis. In the majority of these cases the Roentgeno-



Fig. 3. Roentgenogram showing marked cloudiness of right antrum. No history or symptoms of sinus infection. Intranasal examination negative. On puncture of right antrum about 15 c.c. of foul-smelling pus was evacuated. Following radical intranasal antral operation, there was a marked improvement in the patient's arthritis. The improvement has persisted to date.

logic and rhinologic demonstration of the sinus infection was not difficult.

b. There was a second group of patients who harbored an obscure low-grade nasal infection which was overlooked as a rule clinically, because it was considered of insufficient importance for any detailed Roentgenologic or rhinologic study. The history of these arthritic patients shows that their treatment had been thorough in all respects

but this one, and that in spite of all treatment they had grown progressively worse. In these cases a cure was effected only after the existence of a seemingly unimportant sinus infection was demonstrated and the pathologic condition treated or eradicated.

c. A third group of arthritis cases in whom sinusitis was known to be present had failed to show improvement in spite of treatment of the sinuses because the Roentgenologic study of the sinuses was incomplete and did not reveal the entire extent of pathologic involvement of the sinuses.



Fig. 4. Roentgenogram showing marked cloudiness of the right antrum. Marked improvement in the patient's arthritis following window operation upon the right antrum.

d. A fourth group consisted of patients in whom disease was overlooked or only partially diagnosed because the diagnosis of the sinus condition was based entirely upon transillumination and intranasal inspection. In low-grade catarrhal or polypoid disease of the sinuses intranasal evidence of the disease process may be very slight or absent. Yet a Roentgenologic examination in such cases may reveal distinct pathologic changes in the sinuses.

e. A fifth group of cases consists of those who suffer recurrences of their arthritis in spite of what might be considered very efficient

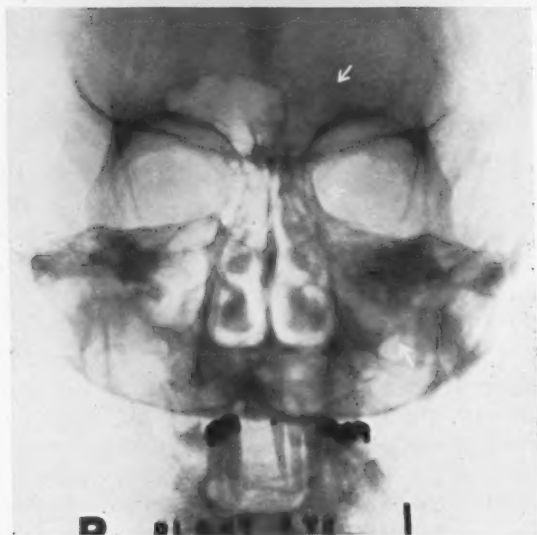
treatment of their sinus infection. Such cases are commonly regarded as proof that chronic arthritis is an incurably progressive disease and that treatment of the infected sinuses of these patients has no effect on the ultimate course of the arthritis. Such argument does not take into consideration that these arthritis patients probably had developed their disease originally because of an impaired constitutional resistance to infection, and that these patients are particularly susceptible to new intercurrent infections in the sinuses, as well as in



Fig. 5. Roentgenogram showing moderate cloudiness of both antra. Pus was found in both antra. Coincidentally with the clearing up of the sinus infection, the patient's arthritis showed marked improvement, which has persisted to date.

other organs of the body. In these cases one must be on constant watch for new infections in order to secure and maintain a permanent clinical cure of the patient.

f. The sixth group of cases, whom we have chosen to call the "silent sinus cases," is a very important group and comprises a surprisingly large proportion of our positive sinus cases. In these patients there is no history of sinus disease, yet they harbor definite sinus infection, which is almost invariably overlooked because of the silent character of the infection. We believe that the occurrence of



Figs. 6 and 7. Roentgenogram showing marked cloudiness of the left frontal, left ethmoids and left antrum. Chronic arthritis of eighteen months' duration. Sinus disease not suspected clinically. Intranasal examination negative. Thick, yellow pus evacuated from left antrum. Complete clearing up of arthritis following window operation upon antrum and opening up of left ethmoid cells. Patient well to date.

these "silent sinus cases" makes the routine Roentgenologic examination of the sinuses imperative in every case of chronic arthritis, regardless of the absence or presence of symptoms of sinusitis.

Discussion: The many possibilities of error in the Roentgenologic and clinical demonstration of infection in the sinuses show how very frequently the presence of a sinusitis in an arthritis patient may be overlooked unless the most painstaking efforts are made in the search for the sinus infection.

The writers feel convinced that sinusitis played an important rôle in the onset and prognosis of many of their cases of arthritis, and that the good clinical results obtained in many of their patients must be attributed in large measure to the aid of the rhinologist. Some of the patients failed to respond to every other form of treatment and their arthritis grew progressively worse until the infection in their sinuses was ameliorated or cleared up. It was only then that the patients began to improve, and their arthritis began to respond to treatment. No case of chronic arthritis was observed in which it could be said that the arthritis was aggravated by rhinologic treatment of the patient's sinus disease.

STATISTICS.

1. From June, 1926, to June, 1931, stereoscopic Roentgenologic examination of the sinuses was carried out in 386 consecutive cases of chronic arthritis.
2. One hundred and forty-two were men, and 244 were women.
3. Youngest was age 15 years, oldest was age 77 years.
4. The majority of patients were between 30 and 60 years of age.
5. In 124 cases, or 32 per cent, the Roentgenograms showed well aerated sinuses.
6. In 262 cases, or 68 per cent, the Roentgenograms revealed slight, moderate or marked changes suggestive or indicative of sinus disease.
7. Of these 262 cases, 126 cases were examined by one or more rhinologists.
8. Of the above 126 cases, the rhinologist found very slight or no evidence of active nasal disease in 33 cases.
9. In 93 cases of the above 126, the rhinologist found corroborative clinical evidence of active nasal disease sufficient to warrant conservative or radical treatment.
10. In other words, in three out of every four cases showing Roentgenologic evidence of sinus pathology, the rhinologist found sufficient corroborative clinical evidence to warrant conservative or radical treatment.

Type
disinfect

Don't forget to mention not many noted cases because of unreported cases

11. Of the above 93 patients with active sinus disease, only 16 had a definite history of sinus disease. The remaining 77 harbored sinus disease as a silent focus of infection.

12. Forty-two patients of the 93 were not treated rhinologically for the following reasons:

- a. They had no faith in sinus therapy.
- b. They were advised by their family physicians against sinus therapy.
- c. Financial reasons.
- d. Other foci were considered to be of greater immediate importance.

Of this group, the arthritis failed to show clinical improvement or grew worse in 23 cases, and showed improvement in 19 cases. Seven patients showed moderate improvement, nine showed marked improvement, and three very marked improvement. The improvement of these 19 patients was probably due to the fact the sinus infection was of little or no etiologic significance in these cases.

13. In five cases of the 93, the rhinologic treatment was considered to be incomplete and of a generally unsatisfactory nature because of lack of co-operation on the part of the patient. In these five cases, the arthritis failed to show any appreciable degree of improvement.

14. Twenty-eight patients of the 93 received conservative rhinologic treatment, such as nasal medication, suction packs, nasal irrigations and submucous operations upon the nasal septum.

Of these, one case showed no improvement, and 27 patients showed improvement of varying degree as follows: 7 moderately improved; 10 markedly improved; 10 very markedly improved.

15. Eighteen cases of the 93 received radical treatment, such as antral windows, Caldwell-Luc operations, ethmoidectomies and opening of the sphenoid sinuses.

Of this group there was no improvement in one case and improvement of varying degree in 17 cases as follows: 1 moderately improved; 5 markedly improved; 11 very markedly improved.

The following few case histories are cited to illustrate the relationship of sinus infection to chronic arthritis:

Case 1: Mr. H. S., age 43 years, was first examined on Dec. 30, 1929. He gave a history of progressive stiffness and pains in the left shoulder and back of three years' duration. He had had nasal catarrh all his life. Clinical examination revealed the presence of several devitalized teeth. There was tenderness over the lower dorsal and lumbar spine, and painful and limited motion of the left arm.

which could not be abducted beyond a right angle in any direction. Previous treatment consisted of the removal of several devitalized teeth, vaccine therapy, and baking of the shoulder. All these failed to relieve the patient's symptoms. Roentgenograms of his sinuses showed marked cloudiness of both frontals, both ethmoids and of the right antrum (see Fig. 1). Dr. Lee Hurd washed out about a teaspoonful of mucus material from the right antrum and concluded on the basis of his rhinologic examination in conjunction with the Roentgenologic findings that the infection in the sinuses was of a low-grade polypoid type. Conservative rhinologic treatment resulted in marked improvement of the arthritis.

low grade

Case 2: Mr. D. P. was first examined on March 9, 1927. He complained of pains in the right hand, right big toe and left toe of two years' duration. There was no sinus history. Roentgenologic examination of the feet revealed marked arthritis changes of both feet and slight arthritis changes in both hands. Physical examination revealed the presence of devitalized teeth and infected tonsils. Roentgenologic examination of the sinuses showed marked cloudiness of the right antrum (see Fig. 2) and slight cloudiness of the left ethmoids. The rhinologic examination by Dr. J. King disclosed pus in the right antrum. After several antral irrigations, the patient's arthritis showed marked improvement.

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what type arth?

Case 3: Mrs. L. A. D., age 53 years, was examined Dec. 7, 1925. She complained of severe pains in the hands, knees, feet, neck and lower back, of three years' duration. She had had a tonsillectomy performed fourteen months previously without relief of the pain. For three months, prior to this examination, she had been under the care of an internist, who did not suspect the presence of sinus disease and whose treatment did not alleviate in the least the patient's arthritis. There was nothing in the history to indicate sinus infection. The Roentgenologic examination of the teeth and sinuses revealed three devitalized teeth and moderate cloudiness of the right antrum (see Fig. 3). The rhinologic examination of Dr. Lee Hurd showed nothing abnormal in the nose, but on puncture of the right antrum, about 15 c.c. of foul-smelling pus was evacuated. On Dec. 14, 1925, a radical intranasal operation upon the right antrum was performed. Following this operation, the patient's symptoms began to subside in a very satisfactory manner. By Jan. 8, 1929, the patient's pains had practically disappeared. At that time, two devitalized teeth were extracted as a prophylactic measure. Two months after the sinus operation, the patient's symptoms had subsided to such an extent that she was able to resume her work. She has been

earning her own living to date and the improvement in the arthritis has persisted to date.

Case 4: Master A. G., age 15 years, was first examined Feb. 4, 1931. He gave a history of an attack of acute rheumatic fever and of polyarthritis four years before, which confined him to bed for two months. Since then he had no symptoms of arthritis until the present attack. At the time of the examination, the patient complained of pains in the hips, lower back and neck. He gave a history of frequent protracted colds, nasal discharge and postnasal drip. He had had a tonsillectomy ten years previously. Physical examination revealed pus in the posterior wall of the pharynx and in the nose. Roentgenograms of the sinuses revealed slight cloudiness of the right frontal and right ethmoids, moderate cloudiness of the left ethmoids, and marked cloudiness of the right antrum (see Fig. 4). After rhinologic examination of the nose, Dr. J. King advised a window operation upon the antrum for drainage and ventilation. This was performed early in March, 1931. Immediately following the operation, there was a marked exacerbation of the joint pains, which lasted for three days. The acute process then began to subside and by March 16, 1931, the patient showed marked improvement. The improvement continued until he was practically free of symptoms on April 3, 1931. When last seen, on Dec. 23, 1931, there had been no recurrence of the joint pains and the patient was feeling perfectly well.

Case 5: Mrs. L. S., housewife, age 37 years, was examined on Dec. 11, 1928. She gave a history of many acute attacks of polyarthritis for the past twenty years. Throughout many of these attacks, the patient was bedridden. At the time of the examination, her ankles were markedly swollen and painful and she complained of pain in the knees and hands. Roentgenologic examination of the hands revealed destructive bony changes in the phalangeal joints. At the time of the examination the patient was suffering from an upper respiratory infection. Roentgenologic examination of the sinuses, on Jan. 2, 1929, showed a moderately cloudy right frontal, moderate cloudiness of both antra (see Fig. 5), marked cloudiness of the ethmoid cells of both sides and cloudiness of both sphenoids. Rhinologic examination by Dr. Stuart Craig revealed pus in both antra. The antra were repeatedly irrigated and intranasal medication and suction were used over a considerable period of time. On March 15, 1929, the irrigating fluid returned clear from the right antrum and mixed with a small amount of mucus from the left antrum. Coincidentally with the improvement of the nasal condition, the

patient's arthritis began to show a marked improvement. Whereas, the patient could walk but a few steps with the greatest difficulty at the time of her first examination, she was able to walk a two-mile distance without discomfort in September of the following year. When last seen, on Dec. 23, 1931, there had been no recurrence of the arthritis.

Case 6: Mrs. A. B., housewife, age 63 years, was examined on Dec. 2, 1927. She complained of marked pain in the right knee with limitation of movement of 18 months' duration. For two months prior to this examination, she was bedridden on account of an acute exacerbation of the process in the right knee. She had been under the care of several physicians, without obtaining relief. Because of frequent attacks of "sore throat" she had been under the care of a rhinologist. At no time, however, had the question of a possible sinusitis been discussed with the patient, nor had a Roentgenologic examination of the sinuses been made. The physical examination failed to reveal anything that could be considered of etiologic significance. A routine Roentgenologic examination of the sinuses showed, however, a marked cloudiness of the left frontal, left ethmoids and left antrum (see Figs. 6 and 7). The nasal septum was deviated to the left and the turbinates of the left side were markedly enlarged. On Dec. 12, 1927, rhinologic examination of the nose by Dr. Hurd did not disclose any pus in the nose. In view of the positive Roentgenologic evidence, the left antrum was punctured, and about 12 c.c. of thick, yellow pus was evacuated. An intranasal operation was advised and was performed early in January, 1928, by Dr. Hurd. A large window was made in the antrum, which was found to contain pus and a thickened membrane. The left ethmoidal cells were opened. They did not contain pus but did show considerable thickening of the bony walls.

After the operation, the pain in the knee decreased in intensity and the improvement continued until the pain had entirely disappeared by April 6, 1928. Up to December, 1931, there had not been any recurrence of the arthritis.

SUMMARY.

1. Unrecognized extensive sinus infection of "silent character" may exist in a patient suffering from chronic arthritis and baffle all efforts to cure the patients until treated or eradicated.

2. Routine Roentgenologic examination of the nasal accessory sinuses of all chronic arthritis cases will disclose many cases of sinus disease which might otherwise escape detection.

3. Clinical observation of chronic arthritis cases in which sinus disease was discovered and treated has convinced the writers of a close relationship between these two diseases in many of their cases.

4. Rhinologic treatment of diseased sinuses has in many instances aided materially in the clinical cure of chronic arthritis. No case was observed in which competent and careful rhinologic treatment caused any ill effect upon the patient's arthritis.

133 East 58th Street.

A SLIGHT MODIFICATION OF THE DOWLING PACK.

DR. J. B. H. WARING, Cincinnati.

The Dowling argyrol nasal pack treatment has been of wonderful service to the average rhinologist, and if any medals are lying around unemployed, Dr. Dowling should surely have one. The original technique as developed by Dr. Dowling is, of course, known to every nose and throat practitioner. There is one phase, however, I might emphasize. Recently a patient described her treatment with Dowling packs by a previous physician, and commented how tiresome it was to have to remain in the office something over an hour waiting for the treatment to be effective.

This was one adverse feature of the treatment; the time it kept patients in the office waiting removal of the packs, and, incidentally, occupying chair space that might better be employed for a new patient. My modified Dowling packs have a small bit of tape attached long enough to hang out of the nostril two or three inches. If only one side of the nose is pack treated, the tape is cut off and left just long enough so that the patient can grasp end of same and remove from nostril at end of a specified time. If both sides of the nose are packed, the tapes are tied together and the ends trimmed short. By grasping the knotted portion, both packs may be removed from the nostrils at any specified time. This enables the patient to return home instead of waiting in the office from a half-hour up for the physician to personally remove packs.

6075 Montgomery Road.

THE RESPIRATORY FUNCTION OF THE NOSE AND NASAL OBSTRUCTIONS.*

DR. B. M. BECKER, Brooklyn.

The functions of the nose are: 1. Respiration. 2. Olfaction. 3. Vocalization, acting as a resonator and modifier of sound during the process of speech formation. 4. Ventilation, aerating the sinuses and carrying off vitiated air from them. 5. Drainage, acting as a common channel to carry off the discharges from the sinuses, normal and pathologic. 6. Equalization, balancing the pressure in the tympanic cavities. 7. Protection, by means of the turbinals, ciliated epithelium and vibrissae it warms and filters the air and gets rid of deleterious substances which would otherwise reach the lungs.

This paper is concerned with nasal respiration and obstruction.

The normal respiratory function of the nose with its pathologic deviations has not received the consideration it deserves by virtue of its great importance in the maintenance of good health and its influence on development. While much good work has been done on the gross and microscopic anatomy and pathology of the nasal structures and its accessory sinuses, comparatively little has been done and written on the subject of nasal physiology.

Unlike the auditory and visual functions which have been investigated from every angle and voluminously written about, the investigation of the nasal respiratory function and the literature on this subject sorely lag behind. The great difficulty encountered at the very outset, in the consideration of this function, is the vagueness and indefiniteness as to what constitutes normal respiratory capacity. Criteria or objective standards of comparison are totally lacking in this particular field, and the statements of the patient are our chief and only reliance in forming a judgment concerning this function.

In investigating the auditory and visual functions, the examiner is equipped with a number of instruments of precision and differential tests of proved value by means of which he can detect any deviation from the normal and can record them for future reference and as a basis for comparison, even to the degree of exposing malinger-ing by means of these tests.

*From the Departments of Otolaryngology, the Long Island College and the United Israel-Zion Hospitals.

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None of this precision obtains in the examination of the nasal respiratory function, and since there exists a vagueness, in the mind of the examiner, as to what is normal respiratory capacity, it follows that the abnormal is not readily recognized, unless it be of a marked degree of subnormality. Thus, this condition may exist for long periods of time and its presence be unknown alike to the patient and the physician.

Patients will frequently neglect nasal obstructions indefinitely, especially is this true when the obstruction is unilateral or when bilateral, but of a mild degree. The reason for this neglect is two-fold. In the first place, it requires a marked encroachment on the space of the nasal air passages before the patient will experience a sense of air hunger on the exercise of nasal respiration; and secondly, the mouth shares this function with the nose, and in marked or total obstruction the oral cavity will entirely supersede the nasal cavities in this functional capacity.

CLASSIFICATION OF NASAL OBSTRUCTIONS.

Nasal obstructions may, for convenience, be divided *r.* with reference to time or duration into *a.* acute, *b.* chronic, *c.* transitory and *d.* permanent.

In the transitory variety are included all those obstructions which can be removed by the patient himself or by nonsurgical means. Under this head are considered accumulations of secretions in the nasal chambers, normal or pathologic, which block the air passages and which the patient can get rid of by properly clearing his nose; obstructions due to allergic or vasomotor disturbances which have a tendency to disappear spontaneously or to change frequently their position from one nostril to the other or are amenable to medical or dietetic treatment; obstructions produced artificially for experimental, diagnostic or therapeutic purposes. Under the head of permanent obstructions are considered those due to definite hypertrophies or hyperplasias of the soft, cartilaginous or osseous intranasal structures brought about by repeated inflammatory processes; neoplastic growths; malformations or deformities of the nasal structures, congenital or acquired, such as septal deviations, atresias and synechias; foreign bodies in the nasal passages which may remain lodged indefinitely if not removed and give rise sometimes to symptoms simulating some serious disorders, such as diphtheria, malignancy, etc. Because this last group is amenable to surgical intervention only, they may be spoken of as surgical obstructions in contradistinction to the former group, which may be designated as medical obstructions.

2. With reference to site or location, obstructions are classed as *a.* intranasal and *b.* extranasal. Both of these varieties are subdivided into 1. anterior and 2. posterior.

The extranasal posterior obstructions may be caused by hypertrophied adenoids; tumors in the nasopharynx; peritonsillar, retropharyngeal and parapharyngeal abscesses; phlegmonous or edematous swellings in the pharyngeal tissues from any cause, blocking the choanae.

The extranasal anterior obstructions may be caused by neoplastic or inflammatory swellings and edema of the upper lip or of the superior maxilla, encroaching on the openings of the anterior nares.

The intranasal obstructions are caused by the various pathologic conditions previously enumerated and depending upon their position in relation to the anterior or posterior nares and they are named accordingly.

3. With reference to their degree or extent, obstructions are divided into *a.* partial and *b.* complete. The former may vary from the mildest degree, bordering on the normal to almost complete obstruction.

Diagnosis of Nasal Obstruction: Aside from the statement of the patient regarding the condition of his nasal respiratory function, rhinologists rely upon two objective methods in the examination of the patient; namely, one physical and the other functional.

The first is visual and consists in examining the condition of the intranasal structures by means of anterior and posterior rhinoscopy. The second is tactile and consists in having the patient exhale against the dorsal surface of the examiner's hand, which is held close to one nostril of the patient, while the other nostril is occluded by the examiner with the ball of the thumb.

While rhinoscopy is of prime importance in examining for nasal obstruction, it does not furnish precise data relative to nasal physiology. From the gross anatomy and pathology of the nasal structures we infer its functional capacity, but while function depends upon structure and any anatomic deviation from the normal presupposes a disturbance of the physiology of the part so affected, yet the two do not always bear a definite ratio to one another. This is well exemplified in the case of the ear. Often, in cases of conductive deafness when, from the appearance of the drums, we decide that the ear showing the more pronounced pathologic changes is the worst ear functionally, we are surprised to hear the patient declare that this is the better ear, and to find it so on functional testing of the two ears. In like manner, when from the appearance of the structures of both

nasal cavities as revealed by rhinoscopy, such as a deflected septum or hypertrophied turbinates, etc., we presume to judge of respiratory capacity, we are sometimes surprised to hear the patient express himself to the contrary. On the other hand, a patient may present himself, complaining of functional nasal insufficiency, and by the visual and tactile examination the examiner finds no warrant for such complaint. I have heard this condition designated as a respiratory neurosis on the strength of the findings. To my mind, we are not justified in pronouncing these cases neuroses until we have developed a more thorough technique in the examination of the nasal respiratory function, by means of objective functional tests.

The tactile method of testing nasal respiratory functions suffers from two serious drawbacks. The first is that it furnishes information only of the expiratory phase of respiration, while our chief interest and that of the patient is the inspirational phase of the process—whether the patient can get a sufficient supply of air into his lungs through the nasal passages, without any special effort. It is inferred from this test that if the patient's expiratory effort is free and forceful, the inspiration must likewise be adequate. The second drawback to this method of testing is that the data it furnishes with respect to expiration are not altogether reliable. When a patient suffers from unilateral nasal obstruction and the hand is held in the usual manner before each nostril, it will be found often that the air current striking the hand is more vigorous on the side of the obstruction. The reason for this seeming paradox is that when a patient is instructed to exhale through the partially obstructed nostril, the other being blocked by the examiner's finger, there is a tendency on his part to force the air through the obstruction, while through the normal nostril he will breathe normally. Thus the air current from the obstructed nostril, although smaller but striking the hand with greater force, will give the impression of coming from a normally functioning nostril. The correctness of this observation may be proved experimentally by using a Politzer bag to represent the lungs. To the bag attach by means of a forked hard rubber or metal piece, two soft rubber tubes of equal length but of different calibre. Let the wider tube represent the unobstructed and the narrower tube the obstructed nostril. Now compress the bag forcefully and let the air current coming from the smaller tube strike your hand (the wider tube being blocked by the fingers). Repeat the process by permitting the air to escape through the other tube but let the compression be more moderate and the same impression is gained as when testing the unequally functioning nostrils.

Methods of Examination for Nasal Respiratory Function: 1. Inspection: *a.* rhinoscopy, *b.* observation of the movements of the alae nasi, *c.* observation of the mouth.

b. It will be found in nasal obstructions that on inspiration the alae nasi become drawn in, approach the nasal septum, and the greater the obstruction the greater the inward movement of the nostrils. This sign is best brought out in the following way: The examiner, sitting opposite the patient with a bright light centered on the nostrils, closes up one of the patient's nostrils with the ball of his thumb (care being taken not to distort the closed nostril by undue pressure), and observes the movements of the ala of the closed nostril. If the open nostril is functionally inadequate the ala of the nostril closed with the finger will move inward, and in marked obstruction will completely come to rest on the septum. The reason for this is found in the fact that when the patient attempts to inhale through an obstructed nostril the air in the opposite nostril which is closed by the thumb is exhausted and a partial vacuum is created in it, hence the sinking in of the ala. In marked cases of obstruction when the obstructing thumb is quickly removed the examiner will feel the pull on his thumb and hear a loud sound, as if the air rushes in the released nostril.

c. The examiner proceeds as in the former test but focuses the light on the lips of the patient. If there is marked obstruction of the nostril thus tested the patient unconsciously will open his mouth or part his lips very slightly, to overcome the air deficiency. In this test the examiner must continue for fully a minute or two, for even in a marked case of obstruction when the patient is instructed to breathe through his nostril with the mouth closed, he will do so for a short while without parting his lips. This sign can be elicited only on prolonged observation.

2. *Tactile:* Knowing its limitations, the examiner may use this functional test as a rough estimate of nasal expiratory capacity. In order not to be misled by this test, as pointed out before, the patient is instructed to use forced expiration through either nostril and thus obviate the false impression often obtained in the routine manner of testing.

3. *Auscultation:* This test depends on its efficacy by listening to the breath sounds. This is performed by means of rubber tube, in one end of which a nasal tip is inserted, which goes to the patient's nostril to be tested, and the other end of the tube, either free or fitted with an ear tip, is inserted loosely in the ear of the examiner. During this test one nostril is closed by the thumb, as in the previous

tests, and the breath sound compared both during quiet respiration and forced respiration. In this test both the inspiratory and expiratory phases of respiration are observed and compared, the former giving the more pronounced sensation to the ear. This test is based both on auditory and tactile sensations; not only does the ear perceive the sounds produced by breathing, but the drum also feels the air current thus produced.

4. *Tuning Fork Test:* When a strong current of air, as produced by forced expiration, is directed against a tuning fork of the higher frequencies, the force of the air will activate the fork. Especially is this result well marked when the forks of 2048 d. v. (c_4) and 4096 d. v. (c_5) are used.

The test consists in having the patient blow forcibly against one of these forks, with each nostril separately, while the other is closed by the examiner's finger, and comparing the intensity and duration of the sound thus produced by each nostril.

Before these tests, the patient must be instructed to clear his nose thoroughly, otherwise the results may be confusing.

It will be found by these tests, especially the auscultation test, that the respiratory capacity of a widely open and normally functioning nostril equals the oral respiratory capacity. Therefore, the respiratory function of the mouth is to be taken as a standard of comparison in all the functional tests, otherwise they would be of relative value only. Without this criterion the results obtained by these methods would inform us of the comparatively functional capacity of each nostril as contrasted with the other, but would fail to render data concerning the normality or deviation from the normal, for each nostril. But when the nostrils are compared with each other and the two compared with the oral respiratory function as a norm, then are we in a position to form a proper judgment as to what constitutes normal nasal respiratory function for each individual.

4802 18th Avenue.

**NASAL FIBROMA GROWING FROM BODY OF
SPHENOID SUCCESSFULLY REMOVED WITH
INTRODUCTION OF RADIUM NEEDLES.
CASE REPORT.***

DR. R. H. FISHER, New Orleans.

This case is presented because of the extremely interesting phases of the case and the rarity with which we are confronted with this type of tumor.

Miss H. R., white female, single, born May 11, 1908. Usual diseases of childhood, measles, mumps and whooping cough. Since old enough to remember has had difficulty in breathing through right nares and frequent colds in head.

Tonsillectomy and adenoidectomy in 1923 at age 15 years. Had severe bleeding three days after operation. No improvement in breathing after operation. Always slept with mouth open and more or less mouth breather when awake. Had constant knowledge that right nostril was more less obstructed and wanted to blow nose frequently. At age of 17 years applied to ear, nose and throat specialist for relief of nasal blocking and three or four nasal hemorrhages within one month, and was told that a submucous resection was indicated, which was performed Feb. 9, 1925, and upon completion of submucous operation a growth was found in postnasal space, at which removal was attempted with profuse bleeding at time of operation; this was controlled by packing, which was removed four days later without any more bleeding and patient was allowed to go home. Was under observation after operation for one-and-one-half years but does not know why, as was not told if growth was recurring. No radium was used.

Several months after discontinuing visits to her doctor, she began feeling that there was trouble in nose, had heavy feeling in head, mostly right side. She then consulted another rhinologist for treatment and relief of symptoms, when she made visits twice a week and received local treatments with sprays and cotton applicators. After one-and-one-half years' treatment was led to believe condition was improving, but such was not the case and patient developed very severe headaches and one or two postnasal hemorrhages.

*Read before the Ophthalmological and Otolaryngological Society of New Orleans, 1932.

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At this time, Nov. 5, 1929, patient came to me for consultation, suffering with severe headaches, nasal bleeding and complete blocking of right nares and profuse mucopurulent discharge. A diagnosis of acute maxillary sinusitis and a large nasal fibroma coming from sphenoid bone was made. The mass was completely filling the nasal cavity and almost protruding from nasal canal anteriorly. It could be seen by postrhinoscopy, filling the whole nasopharyngeal space, and upon retracting soft palate a very good view could be had. A Douglas puncture of the right maxillary antrum was done and thick pus was irrigated from the sinus. The headaches were relieved a great deal following washing of sinus. Three days later, I visited patient at home as she had quite a bit of bleeding from the mass and was suffering with la grippe and severe headache. The bleeding was controlled with astringent sprays and calcium lactate internally. The time had come for something to be done for the relief of the patient and operation for removal of the tumor was considered seriously; but, realizing how difficult a job it would be with the amount of bleeding that would necessarily have been encountered and the danger of fatal hemorrhage under such condition, I decided to follow the safest method, that of introduction of radium needles into tumor mass. On Nov. 20, she was admitted to Hotel Dieu and four radium needles, amounting to $42\frac{1}{2}$ mgs., were inserted into mass in nares, and three needles, 35 mgs., into mass in nasopharynx by retraction of soft palate. Very little bleeding was encountered and needles were removed after six hours' exposure. Five days later, tumor had shrunk considerably, and 14 days after treatment nares was almost free of the obstruction. The tumor shrunk to half-size, but radiation was not sufficient to penetrate mass in sphenoid area; so on May 20, 1930, six months later, five needles, $57\frac{1}{2}$ mgs. radium, were inserted deep into mass and left four-and-one-half hours. The head of one needle pulled out upon being removed by the nurse in the radiological department and was in tissue seven-and-one-half hours before being successfully removed by myself with punch forceps. The tumor shrunk away beautifully and, with exception of application of trichloroacetic acid to certain areas at intervals, nothing more was done until Aug. 25, 1931, when a few small remaining areas were treated with electrocoagulation, which disappeared nicely and the whole area is now nice, smooth and healthy looking.

It is of great interest to see how distorted the sphenoid and ethmoid area and displacement of the middle turbinate bone upward and outward, due to the growth of the tumor and the change of the normal anatomical structure during the growing period of the

patient's life. There are no sphenoid boundaries, only posteriorly, which extends back to the quadrilateral plate of the ethmoid as far backward as it would be possible for it to go. Ethmoidal labyrinth distorted and never developed except for a few cells near orbit, all of which can be seen in lateral view of radiogram; middle turbinate bone can be seen in lateral view of picture, which is quite unusual.

I feel quite confident that the patient is cured and am very glad that the treatment was directed along conservative lines, rather than radical removal, as was done in the past, and not infrequently with fatalities; and would advise the use of radium first in the treatment of any such condition, as I have had the same success in the treatment of several other cases other than fibromatous tumors, and this treatment has caused little inconvenience and saved the patient's life.

724 Audubon Building.

BLOCKADE THEORY OF POLYP FORMATION.

DR. JOHN L. JENKINS, Dallas.

There are several different opinions as to the nature of polyps and how they are formed. Some hold to the idea that it is a new growth and others state that it is in some way a product or result of chronic inflammation.

The type of polyp seen in the nose is always preceded by chronic inflammation of some degree. This inflammation may be of infectious nature or may be due to an allergic cause. The polyp itself is an accumulation of intercellular fluid dammed up in a localized tissue. The dam is usually caused by an infiltration of lymphocytes (round cells), producing a "blockade" of intercellular spaces. The round cell infiltration is caused by the chronic inflammation. The typical picture of chronic inflammation, regardless of its nature, is that of round cell infiltration of the subepithelial tissues and when such infiltration continues to the degree of mechanical obstruction of inter-

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cellular spaces, a local lymph edema occurs. If the blockade remains, a typical polyp forms. If such blockade covers a larger area, multiple polyps may form.

Now if this "blockade" of lymphatic elements is lifted, this accumulated fluid in the polyps will absorb with disappearance of the polyps. I have repeatedly accomplished this "blockade" lift by various methods. X-ray or radium in proper doses will dissolve out the lymphatic elements for a period of time and reabsorption of the polyp fluid occurs. However, if chronic inflammation still exists in the involved tissue, the round cell infiltration reoccurs, the blockade becomes effective and we have reappearance of the polyps. If the polyps are removed, we have the same tendency of reoccurrence if the tissues retain the same pre-existing inflammation. Occasionally, the polyp itself, by its pendulancy or its pressure, may be a factor in producing the chronic inflammation and a sort of vicious circle exist. In this type, if the polyp is removed, there is no reoccurrence. This is true more frequently with single polyps.

If we examine microscopically and chemically an old polyp that has existed for months or years we would be misled by such an analysis. Tissue and chemical changes occur that mask entirely the original picture. The changes that have occurred in this polyp give in very little clue as to its true nature or how it was formed. Experimentation with the newly-formed polyps using radium, X-ray, ketogenic diets and fever therapy have given me this above conception concerning polyps and their formation. I shall report later some very interesting observations in the study of lymphoid tissue of the upper respiratory tract. These observations lead to many revolutionary ideas in the theories of infection and for that reason I am hesitant in reporting them at this time.

Medical Arts Building.

ACTINOMYCOSIS OF THE TONSIL AND TONGUE WITH REPORT OF A CASE.*

DR. ROBERT F. RIDPATH, Philadelphia.

Recognized by Bollinger, this disease, common in cattle, is an infectious process. Israel some years later described the disease in man. In cattle we usually have a tumor-like swelling of the jaw, with ramifications or sinus formation and purulent discharge. Within the purulent materials is found the yellow granules or so-called sulphur grains, which is peculiar to this disease. Although the jaw infection is the most common of the infections in the human being we also have several other locations where the infection is likely to occur. The direct infecting organism found in the secretions coming from or within the ulcerations is found to be a branched organism growing in the mycelia.

Actinomyces is an anaerobic organism and has been described by numerous authorities—Wolff, Israel, Wright and others.

The general consensus of opinion has been that infection enters the tissues through the chewing of straws, splinters, grass, etc. Still later investigators find that the organism merely uses these materials to display its pathologic properties. An infection having taken place, necrosis quickly follows in the cells of the invaded area with the presence of mycelium and a tremendous increase of the leukocytes. A gradual formation of granulation tissue takes place as the process advances. Liquefaction or a breaking down of the tissues with pus in which we have the branching organisms now results. These are surrounded by dense masses of fibrous tissue in the tumor-like masses.

Should a portion of these tumor-like masses be examined at this time the cavity or softened inner area would be found to consist of new granulating tissue loaded with large mononuclear or wandering phagocytic cells. It is these cells which contain fat granules and give the typical yellow color to this layer.

The growth of the mycelium into the tissues with the aid of these mononuclear phagocytic cells, destroys and liquefies. The formation of the encapsulating connective tissue, keeping pace with this process, forming new masses as the disease advances.

*Read before the Section of Otolaryngology of the College of Physicians of Philadelphia, March 16, 1932.

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No tissue is safe from this disease. Bone is penetrated as easily as muscle and cases have been reported where the infection has burrowed through the pericardium and heart muscle into the interior of the heart.

Sixty to 70 per cent of the cases reported seem to have the foci of their infection in the mouth or pharynx. The gingival membrane also plays an important part in the site of entrance as well as the tongue and cheek. The tumor-like lesion usually appears in the parotid or submaxillary region with extensions into the neck.

Actinomycetes is abundant in soil. In 1903, Hiltner and Stormer showed that of the colonies developing on gelatine plates from nor-



mal soil, 5 per cent were liquefiers, 70 per cent nonliquefiers and 20 per cent streptothrix forms.

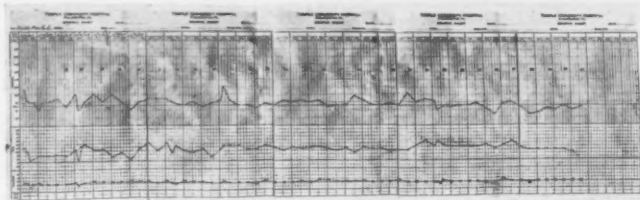
Krainsky, in 1914, claims that the reason why few species have been distinctly recognized in the past is because actinomycetes require special media in order to bring out the specific characteristics.

Actinomycetes cause potato scab and are thought to be concerned in the decomposition of organic matter. It is naturally more common in farmers or those connected with the raising and selling of grain, but cannot be said to be occupational since in the literature we find besides farmers and their coworkers, a physician, an office girl, a janitor, a cabinet maker, two merchants, a naval pensioner, a stone mason and a judge.

The patient usually has a single isolated nodule. This is significant as it must be differentiated from bruises or injury received from carious teeth or a foreign body. Usually severe pain, throbbing local tenderness, general malaise and elevation of temperature. Enlargement of the regional lymph nodes are to be expected. Infection is transferred both through the lymphatics and blood vessels and is essentially chronic in nature.

Diagnosis is easily made by the microscope. It must, however, be differentiated from tertiary syphilis, tuberculosis, epitheliomata, inflammatory cyst and fibroma.

Treatment consists of: 1. Constitutional measures; 2. medicinal drugs; 3. antiseptics applied locally; 4. vaccine therapy; 5. surgical operations; 6. radiotherapy (X-ray and radium).



1. Constitutional same as for tuberculosis.
2. Medicines, iodine, potassium iodid in large doses, 90 gr. a day. Salvarsan, no benefit. Always give iron in some form for the anemia.
3. Hydrogen peroxid to be used in the cavities.
4. Vaccine therapy has not been of any value. Autogenous and stock vaccine have both been used with little, if any, effect.
5. Through opening and curettages of the abscess, excision of the growth and scraping.
6. X-ray has had no marked effect. Radium is doubtful, although it has helped thoracic cases.

Frank Spencer, of Denver, Colo., quotes a case in Jackson and Coates' book where an actinomycotic granuloma was found in an Italian coal miner, who took care of the mules inside the stockade of a coal mine.

Allodi reports an unusual case in a farmer, age 30 years, who was working with a threshing machine when it suddenly stopped. He came near the machine to see what was wrong when suddenly the machine began to work again, blowing dusty particles of oats into his mouth. Shortly after, the farmer developed an acute attack of supposed diphtheria, which disappeared spontaneously after some days, leaving a tonsillar actinomycosis.

Report of Case: A. M., colored man, married, age 42 years. Occupation, janitor of building. Referred from the Rhino-Laryngological Dispensary for admittance into Temple Hospital, Nov. 3, 1929, with the *diagnosis* of actinomycosis of tonsils and tongue (left side). The *chief complaint* at the present time according to the history chart is that the patient is unable to talk; it is, therefore, impossible to obtain any history from him. His wife, however, says that the condition from which he is suffering began Oct. 26 with severe pain in left side of neck and tongue, some two weeks following the use of a new tooth brush.

● SAMARITAN HOSPITAL ●
OF VIRGINIA UNIVERSITY
MEDICAL CENTER, VA.
LABORATORY

CASE NO. _____
DATE _____

NAME Mills, Andrew ADDRESS OR HOME _____

DATE 11-18-29 TIME 11-18-29

GENERAL	Sex	M	Age	42
	Sp. Gr.	1.015		
	Height	5' 8"		
	Alb.	85		
	Hb.	14		
	Temp.	98.6		
	Pulse	72		
	Respiration	18		
	BP	110/70		
	Weight	150		
URINARY	Color			
	Specific Gravity	1.015		
	Acidity			
	Albumin			
	Sugar			
	Bilirubin			
	Urobilinogen			
	Crystals			
	Cells			
	W.B.C.	12,000		
BLOOD	Color			
	Specific Gravity	1.015		
	Acidity			
	Albumin			
	Sugar			
	Bilirubin			
	Urobilinogen			
	Crystals			
	Cells			
	W.B.C.	12,000		
SPERMATOCYTES	Color			
	Specific Gravity	1.015		
	Acidity			
	Albumin			
	Sugar			
	Bilirubin			
	Urobilinogen			
	Crystals			
	Cells			
	W.B.C.	12,000		
SMALL PLASMA	Color			
	Specific Gravity	1.015		
	Acidity			
	Albumin			
	Sugar			
	Bilirubin			
	Urobilinogen			
	Crystals			
	Cells			
	W.B.C.	12,000		
FECES	Color			
	Specific Gravity	1.015		
	Acidity			
	Albumin			
	Sugar			
	Bilirubin			
	Urobilinogen			
	Crystals			
	Cells			
	W.B.C.	12,000		

His *past history* is as follows: He has had malaria fever. Has been married 23 years. Has had seven children, all living. No bad habits. Physical findings are negative with the exception of the mouth, neck, pharynx and tongue. The tongue is tremendously enlarged, filling almost the entire mouth. This is increasingly so on the left side. By great pressure the left tonsil is seen to be enlarged and engorged and is covered with a thick tenacious pus and mucus and shows a number of ulcerations with yellow debris within the ulcerating surfaces. Large hard masses along the left border of the tongue can be seen and palpated. The pharynx is engorged and thickened. The teeth are in a fair condition, the posterior cervical glands are enlarged and tender to touch. There is a hard indurated swelling

at the angle of the left lower mandible; the patient is emaciated and the supraclavicular and infraclavicular fossa deepened.

On Nov. 6, the patient seemed worse and, the breathing becoming more labored, a tracheotomy was decided upon and performed. The keeping of the tube in place was rather difficult, due to his persistence in trying to remove it, which occurred twice in spite of all our careful watching. The swelling continued, nor was his condition changed in spite of our strenuous treatment until Nov. 14, when softening and a slight contraction of the area along the border of the tongue seemed to be taking place.

On Nov. 16, the general increase and lumping seemed to be quiescent and retrograding. The patient's respiration was less difficult and his general condition improved.

Nov. 16, a spinal puncture was made for: 1. Cell count; 2. Wassermann; 3. smear for fungi.

The fluid was clear. Pressure, 12 m.m. in Hg. The blood and spinal fluid, Wassermann, was negative. The urine was negative for iodine. A special laboratory examination of Nov. 6, 1929, reports: "Bloody discharge from tongue and tonsil tumor shows typical ray fungus granules. *Diagnosis: Actinomycosis.*" During the course of his hospitalization, in spite of the severity of the infection, the temperature never went over 101°, and was subnormal on several occasions.

The treatment was as follows: The patient was quarantined. Liquid diet. A mouth wash of R̄ Ac. Carbolici 5i, Potass. Chlor. 5i, Glycerine 5i, Aquae qs oii, was used, *ad libitum*. Incision and drainage of peritonsillar abscess, Nov. 3, 1929. Tracheotomy, Nov. 6, 1929. Intravenous injections of Sodii iodidi gr. XXX three times a day. Saturated solution of Sodii Iodidi M XXX in milk three times a day.

The tracheotomy tube was removed and wound dressed on Nov. 23; there is, however, still marked swelling of left side of tongue and tonsillar areas. Dec. 4, patient was discharged and referred to Nose and Throat Dispensary.

I have seen this patient twice since his discharge and although the tongue is quite thick and hard, there is no evidence of any new lesions forming. His general health was good.

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18th and Chestnut Streets.

TEN COMMANDMENTS FOR SINUS SUFFERERS.

DR. M. JOSEPH MANDELBAUM, New York.

More often than not the sufferer from sinus disease places the burden of cure upon the specialist. While justifiable to a certain degree, there are, nevertheless, so many factors entering into the causation and perpetuation of an attack of sinusitis, that unless they are all taken into consideration and given their proper respective attention, the hope for a cure might not only be indefinitely delayed, but even entirely lost.

It is gradually being more and more appreciated, at least by the profession, that affections of the paranasal sinuses are more than simply a manifestation of a local infection. Numerous factors enter into a rather complex etiologic background. Exposure, local and general resistance, familial catarrhal dyscrasia, dietetic influences, susceptibility to specific bacterial invasion and many others, some partly understood and others not at all. It is by disregarding the multiplicity of these influences that many cases which ordinarily with simple local treatment would promptly respond, are unnecessarily prolonged and drag on indefinitely much to the distress of both the patient and physician.

For the physician to personally go into all the details of these important associated etiological factors with each patient is no inconsiderable task, although unless undertaken leaves or should leave one with the feeling of a job half done. Neglect of one or more of the hygienic rules relating to sinus sufferers may easily and frequently does mean another acute attack or an acute exacerbation of a chronic sinusitis.

With this in mind, both as a time-saver to the busy rhinologist, and as a more or less constant reminder to the patient, the following "Ten Commandments for Sinus Sufferers" were formulated. Whenever a patient suffered a setback or was seized with a fresh attack of sinusitis, an attempt was made to determine what dereliction of the rules, if any, had a possible influence in precipitating the last attack.

It was usually found that certain individuals were prone to disregard a particular commandment. In young males particularly, it was found in our experience that wetting the hair in the morning

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and shortly thereafter going into the open, especially in cold weather, very frequently predisposed to an attack.

After a repetition of several successive attacks due to the same cause, after having their attention called to the fact, it was usually very easy to obtain the whole-hearted co-operation of the patient without which a satisfactory result was impossible to promise. The other "commandments" listed are all readily appreciated.

While these factors may seemingly at first glance appear unworthy of attention, they nevertheless are well worth the consideration of both the physician and the patient and, once recognized and followed, will pay dividends in health and freedom from unnecessary attacks of sinus infection far in excess of the small effort involved to carry out a definite and sane plan of hygienic living for the sinus sufferer.

The ten rules are printed on one side of a white card of rather heavy stock; size, 6 x 11 inches. On the reverse side some general information is printed. Just below the center of the upper margin is a small perforation, permitting the card to be hung by a cord or on a tack in a conveniently located place, such as over the bathroom sink or on a dressing table. It thus serves as a constant reminder of the need of the sinus patient to co-operate with his physician in order to help keep himself free from attacks. The "Ten Commandments" are here reprinted in the belief that some colleague might desire to avail himself of the considerable benefit I have obtained from their use in my own practice. I feel that they are a distinct aid to those suffering from affections of the nasal sinuses and that through them they might obtain a more comprehensive understanding of this very prevalent form of illness and a fuller appreciation of the patient's not inconsiderable share of responsibility in getting well and remaining so.

TEN COMMANDMENTS FOR SINUS SUFFERERS.

1. *Do not wet your hair* on leaving your home in the morning, particularly in cold weather, as sudden chilling can cause congestion of the nose, resulting in a sinus attack. If you must use something to keep your hair in place, use plain petroleum jelly or one of the many excellent preparations now on the market for that purpose.

2. *Do not swim or dive*, especially the latter. They are dangerous pastimes for sinus sufferers as well as those suffering from ear trouble. They may bring on acute attacks in those predisposed and in chronic sufferers bring on acute recurrences.

3. *Do not get wet feet* as "catching cold" may bring on an attack of sinus trouble. Wear thick soles in cold weather and rubbers in

wet weather. Thin paper-like soles of evening slippers may be fashionable for debutantes but are also friendly to undertakers.

4. *Do not smoke or drink* during acute attacks of sinus trouble. Those susceptible to such attacks and chronic sufferers as a rule should indulge very moderately. Better yet, not at all.

5. *Do not go without a hat* except in the midsummer months and not even then too long in the very hot sun. Uncovered heads in fall, winter or early spring, needlessly subjects thousands to attacks of sinusitis and other respiratory diseases.

6. *Do not stay in a draught* either while asleep or awake. Most people who catch cold easily and especially those subject to sinus trouble are susceptible to air currents. Running out of a hot room into the cold open air without a covered head and a proper weight overcoat just for a moment not infrequently induces a severe head cold and lays the foundation for a sinus attack. Going into the open air in cold weather while perspiring is likewise to be condemned.

7. *Do not over-indulge in food* as too much food overloads the bowels. An overloaded colon in many individuals is a source of reduced vitality and lowered resistance. Daily action of the bowels is important in sinus sufferers, as thus a large amount of swallowed nasal discharge is swept out of the intestinal canal.

8. *Do not take cold shower baths* in the morning, particularly in cold weather, unless you protect your head with a rubber cap. If you must do so, do not leave the house before your body is warm. Better still, bathe before retiring.

9. *Do not wear summer underwear* in the late fall, winter or early spring. Animals grow thicker hair in the cold months, and shed it in the warm months. Humans cannot, so we must change the weight of our underwear according to the season. Wool or woolen mixtures in various weights should be worn for the cooler periods.

10. *Do not neglect your general health* as the condition of your mind, nerves, skin, teeth, stomach, intestines, etc., all indirectly influence your sinus condition. Health constitutes the proper functioning of every bodily organ, not only individually, but is that finely balanced co-ordination of each of the many bodily systems in relation to each other, and to the whole. Lowered general health can in the susceptible induce sinus disease, and *vice versa*, sinus disease can affect the general health.

(Reverse side of card.)

To restore your nose to a healthy condition involves a double responsibility; the doctor's and your own. With the proper co-operation of both, satisfactory results may be expected.

Medical as well as home care is but a part of the treatment necessary for improvement. Attention to the hygienic details listed on the reverse side of this card is equally important.

In many cases where supposedly permanent relief has been attained, the breaking of these "commandments" has resulted in an unexpected attack.

Our local climate with its violent weather changes may suddenly induce an occasional sinus attack, despite the most scrupulous attention of doctor and patient. Such recurrences, however, are usually easily controlled.

Faithful observance of these rules will materially assist you in avoiding unnecessary future attacks, brought on by weather conditions or other causes.

27 West 72nd Street.

SEWING MACHINE NEEDLE IN LUNG.

DR. DAVID H. JONES, New York.

E. S., female, age 8 years, while picking her teeth with a sewing machine needle, on Nov. 3, 1931, swallowed it and was immediately seized with a violent coughing attack. She was taken to a nearby hospital, and was given bulky food to force the needle through the intestinal tract. No X-ray was taken, and she remained in the hospital three days.

Child returned home, attended school, and was seen by the school physician, who suggested an X-ray examination. On Nov. 16, child was sent to Grasslands Hospital, where a "radiographic examination showed a metallic foreign body, the appearance of a sewing machine needle with point up, located in posterior branch of right lower main bronchus (two views, anterior, posterior and lateral)."

There being no biplane X-ray machine at Grasslands Hospital, patient was transferred to Manhattan Eye, Ear and Throat Hospital on Nov. 16. On Nov. 17, "radiographic examination showed that needle was in intestinal tract at duodeno-jejunal angle with the point down."

Child was then returned to Grasslands Hospital, and on Nov. 19, 25 and Dec. 3, radiographic examination showed the needle to be in the same position.

On Dec. 5, an exploratory laparotomy was done. On entering the abdominal cavity the needle pricked the surgeon's finger through his rubber glove. As considerable time was spent searching and the patient's pulse and respiration became rapid, it was necessary to close the abdomen without locating the needle. Dec. 8, "radiographic examination shows the needle to have been displaced and the point is now opposite the transverse process of the second lumbar vertebra on the left side. The base of the needle is directed anteriorly."

"Another X-ray, on Dec. 14, shows needle lying with its long axis transverse to the long axis of the body in the colon in the upper left quadrant."

Final X-ray, on Dec. 22, shows no evidence of needle. Unfortunately, the stools were not watched and the needle was not recovered.

The fact that the needle remained in the posterior branch of the right lower main bronchus for nearly two weeks without causing symptoms is not unusual, but the coughing up of the needle and its passage through the bronchi and glottis, and being swallowed without a history of a violent coughing attack, is the peculiar incident.

Another peculiarity in this case is that the surgeon received a prick of the needle on the tip of his finger, through his rubber glove, which was seen on removal of the glove, and that there was no infection of the peritoneal cavity following the puncture of the intestinal wall.

Many foreign bodies remain fixed at the duodeno-jejunal angle, being caught in the folds of the intestine, and as the duodeno-jejunal junction is behind the stomach, it is very difficult to palpate at a laparotomy.

Another fact which we should always remember is to follow Dr. Chevalier Jackson's dictum, "Always take an X-ray picture in all suspected foreign bodies."

On careful perusal of the literature of sharp foreign bodies in the bronchi, no case of like nature has been reported.

140 East 54th Street.

PYOCLE OF THE FRONTAL SINUSES.

DR. T. E. BEYER, Denver.

Mucocele and pyocle of the nasal accessory sinuses occur very rarely. In 1909, Gerber¹ reviewed 169 cases, including those reported by Logan Turner², and not a few of the 74 cases reported since by Dabney³. To these, Howarth⁴ added 14 cases in 1921, and Boenninghaus⁵ 30 cases in 1923.

The following case is reported not only because of its comparative rarity but also because the X-ray findings, which were diagnostic, have not heretofore been alluded to in the literature.

Case Report: History: Mrs. G. E., age 52 years, complained of extensive nasal "catarrh" years ago, for which she used to snuff salt water. Ten years ago, she suffered an attack of acute purulent left frontal sinusitis, from which, after conservative treatment, she recovered in three to four weeks. Two years later, she had another attack lasting a week, characterized by "terrible pain" and followed by discoloration of the forehead and face.

This spring, she has been suffering from slight headaches, supra-orbital neuralgia, and ineptitude for work. About six weeks ago, she noticed some swelling of the forehead, which has been gradually increasing in size. At no time has there been any interference with nasal respiration, nor has there been any nasal discharge. The eyes have not been affected.

Ten days ago, following hot applications, she noticed a soft swelling at the inner orbital angle on the left side.

Findings: Examination revealed a well nourished woman, who did not appear acutely ill. At the inner orbital angle above the canthus on the left side there was a soft, tender, doughy swelling of regular contour. Aspiration of this showed pus. The upper lid was edematous. The resulting narrowing of the palpebral fissure gave the appearance of strabismus. There was no exophthalmus and no chemosis. The pupils were equal and reacted to light.

The whole left frontal region was swollen and tender. The skin and subcutaneous tissues appeared to be thickened and under tension, but there was no discoloration. Deep pressure suggested a bony defect with well defined edges at the periphery. The lachrymal sac was apparently not involved.

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Rhinoscopy showed a high deflection of the cartilaginous septum to the left, which was not completely obstructive. There was no trace of pus or other secretion in the middle meatus or elsewhere in the nose or nasopharynx. The left middle turbinate appeared to be normal. An attempt to pass a probe into the nasofrontal duct after shrinkage with cocain and adrenalin proved unsuccessful.

Transillumination and X-rays: On transillumination with a powerful lamp, both frontal sinuses failed to transmit light. X-ray report was as follows, Right frontal, somewhat hazy; left frontal, ethmoids, antra and sphenoids normal.

The apparent contradictory findings on transillumination and X-ray led to the discovery that the radiographs presented a rare anomaly.

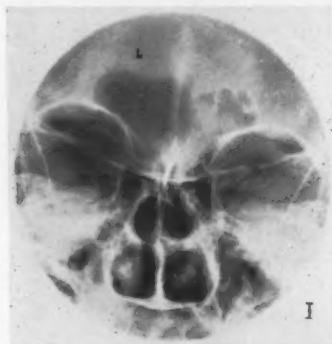


Plate 1. Left frontal sinus darker than normal due to absorption of lime salts. Note regular contour; loss of indentations and septa; loss of heavy white borderline.

Plate 1: The left frontal sinus is obviously darker than normal. This suggests either a sinus of very great depth or a porous frontal plate resulting from the absorption of its calcium salts. In contrast to its fellow on the right, the contour of this sinus is perfectly regular. Normal indentations and septa are absent. At both upper borders there appear small vacuolated areas indicative of the loss of lime salts. The heavy white line of demarcation due to the condensation of calcium salts has disappeared. In Plate 2, taken on the same day but at different angles, the supraorbital ridge is broken and hazy in outline and a portion of the glabella is missing. In both plates the interfrontal septum is missing.

With radiographic evidence of the loss of lime salts and palpable evidence of a purulent tumor originating from and connected with

the frontal sinus, the diagnosis of pyoccele of the frontal sinus seemed justified.

Operation, July 15, 1931. Chloroform anesthesia. Killian incision on the left as for radical frontal operation. On incising the periosteum there was a gush of thick, greenish, odorless pus. The greater part of the anterior wall of the left frontal sinus, the inner third of the supraorbital ridge and a considerable area of the floor had been absorbed. The defect thus produced was large enough to permit easy inspection of both sinuses without further chiseling or curetting. The edges of bone were thin and smooth but very hard. By absorption of the interfrontal septum both sinuses had been converted into one large abscess cavity lined by thin mucous membrane, in contrast to



Plate 2. On the left, supraorbital ridge broken and hazy in outline. Portion of glabella missing.

the edematous polypoid membrane seen in chronic suppurations. On cleansing out the cavity and denuding the sinus of its mucosa, a large bony defect, 3-4 c.m. in diameter, in the middle of the posterior wall came into view. The dura appeared white and smooth and pulsated. The orbital plate was not involved. The normal ostium leading into the nasofrontal duct could not be located with a probe. The cavity was sterilized and a rubber drain sutured into the inner angle of the wound. Culture from the sinus contents proved sterile.

Postoperative course was stormy. There was only a moderate amount of drainage from the external wound but four weeks after operation the patient developed a severe case of erysipelas, which spread all over the head and resulted in three abscesses of the scalp, which had to be drained. A second attack of erysipelas further de-

layed healing but she finally made a complete recovery in about three months. The resulting deformity negligible.

Comment: Early diagnosis and operation of a pyocele of the frontal sinuses terminated in recovery.

In retrospect, the case appears to be classical. Following an acute inflammatory attack eight years ago, the left nasofrontal duct became occluded. Secretion of mucus within the cavity continued and as a result of constant pressure the bony walls were absorbed. The development of mucocoeles then is mechanical, not inflammatory. Inflammation, as Logan Turner contends, probably always precedes their formation but has no actual part in their development.

That the mucocoele was confined to the left frontal sinus over a long period of time before breaking through the interfrontal septum



Plate 3 (taken after patient recovered). Note further absorption of supraorbital ridge.

is evidenced by the fact that the walls of the right frontal sinus were of normal thickness and consistency. In the absence of any history of acute cold or trauma it is impossible to determine with any degree of accuracy when and how the infection took place which changed it to a pyocele.

The majority of mucocoeles and pyocoeles produce clinical phenomena in either the orbital or nasal cavities. This case produced neither but attracted attention only when the anterior wall was broken through. According to Hoffman⁶, the orbital wall is affected in fully 75 per cent of the cases. Dislocation of the bulb occurs with great frequency. Fortunately for this patient, operation was performed before the orbit was encroached upon.

The value of the X-ray in differentiating mucocèles and pyocèles from other conditions affecting the frontal sinuses finds no mention in the literature. Howarth states that the X-ray is of little, if any, help in the diagnosis. Boenninghaus finds the X-ray of value only insofar as it shows the absence of an osteoma. Yet, based on a single case, it would appear that if the lesion has progressed to bone absorption, certain shadows present which, if correctly interpreted, will lead to the diagnosis. In evaluating these shadows and translating them into pathological terms, it must be remembered that the walls as well as the contents of the sinus are the seat of pathological changes. Due to the constant pressure of an expansile tumor, the walls of the sinus are gradually absorbed. The resulting loss of lime salts increases the X-ray penetrability to such an extent that in posteroanterior view they will appear much darker than normal. The contents of the sinus, whether mucus or pus, however, may in a measure neutralize this increased penetrability but hardly enough to cast an opaque shadow. At the periphery of the sinus there are still more characteristic changes. The regular contour, the loss of indentations and septa, the loss of the heavy white line of demarcation are evidence of the loss of calcium salts, such as can occur only by absorption.

The argument may be advanced that drainage should have been re-established through the nasofrontal duct. There were valid reasons against such a procedure. The ethmoids were normal. An enlarged nasofrontal duct would expose the frontal sinus to reinfection from below. Finally, since the entire mucous lining of the sinus was so readily removed, leaving the walls smooth and free from osseous septa, it was felt that the cavity had been dealt with satisfactorily and that external drainage would suffice. Fortunately, this proved to be the case.

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- 419 Majestic Building.

ALKALI RESERVE OF BLOOD PLASMA IN NASAL CONDITIONS.†

DR. MAXWELL FINEBERG, St. Louis.

The treatment of nasal affections has not kept pace with scientific developments of the past decade. Surgery of the nose is limited in its scope and while surgery may be the only treatment of certain clearly indicated conditions, the trend of rhinology today is toward conservatism.

Our medical confreres are becoming more and more skeptical of the advantages of referring their patients to a rhinologist. Some patients are referred with the blanket warning not to permit any operating. It is not uncommon to find patients who have undergone two, three, four or more nasal operations and still be seeking relief. Surgery in the nose has been too lightly undertaken in the past and the pendulum is now swinging in the other direction. It is to be hoped that the pendulum will eventually come to rest in its proper position.

In considering conservative therapy of nasal conditions, the fact that most groups of rhinologists use different methods with probably uniform results seems to indicate that our treatment of these conditions is based on individual technical whims of how to establish ventilation and drainage.

They may be treated by any one of a dozen procedures, *i. e.*, shrinkage with oily or watery spray; Dowling packs; suction, either massive or local; electrocautery; douches and syphons, applications of powders, pastes, solutions, etc. Any or all of these procedures may be of value in relieving the complaints of the patient, but in the final analysis of such treatment are we not justified in asking ourselves whether or not more can be done to insure the future well-being of the patient?

A careful perusal of present day literature will reveal that the rhinological fraternity is becoming more and more agreed that it is not only justifiable to ask ourselves the above question, but that it is absolutely essential that scientific investigations be pursued to ascertain along what channels rational therapy shall be instituted.

Some work along these lines has been undertaken. The recent reports of Hilding and Proetz on the physiology of the nasal epi-

†Preliminary Report.

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thelium and its cilia are very interesting, but as yet have not helped evolve any basic form of rational therapy in sufferers of chronic nasal disease. Experiments such as these may, however, lead us to some basic data which have hitherto been overlooked.

Dean, in his work relating vitamins to chronic nasal conditions in children, seems to have struck a fundamental note in the progress of rhinology. Eugene Lewis has for a long time been writing on the biochemical and biophysical aspects of nasal disease. The late James Stucky, of Louisville, preached for many years that nasal affections were frequently prolonged by some completely irrelevant constitutional factor or factors.

Jarvis, of Barre, Vt., a disciple of Stucky's, is at present working with a group of about fifty otolaryngologists on the acid-base relations of the body with reference to the appearance of the nose in nasal affections. The attempt is being made, from the nutritional point of view, to influence the color of the nasal mucosa by the addition or diminution of acid ash or alkali ash elements. Medication is also given to augment the action.

Jarvis and his group are experimenting clinically and attempting to rationalize the experiments along chemical and physiological lines by using chemical and physiological nomenclature. This process may be faulty but it is the belief of the group that scientific criticism should not hinder the progress of the experiment but rather help the clinical investigations. Thus in this paper, indulgence is asked for the very probable misuse of biochemical terms.

Fundamentally, Jarvis and his group base their work on Stucky's dictum that nasal pathology unless made chronic by local mechanical reasons, should undergo restitution to integrity, and that if such restitution does not occur then the cause is due very probably to constitutional factors. Following along these lines, the group have made a study of the color index of the nasal mucosa and from clinical observations have deduced that a red nasal mucosa is indicative of an alkaline ash deficiency of nutritional origin. Conversely, the pale mucosa is indicative of an acid ash deficiency. Clinically, therapy applied along these lines has produced results in some cases where all other remedies have failed.

The purpose of this paper is not to discuss the pros and cons of Jarvis' group's treatment. Suffice it to say that as a member of the group the writer is convinced that the upper respiratory membranes are influenced by acid alkali factors in the nutritional intake. Doubtless other factors, such as the vitamins, mineral and inorganic salt metabolism, enter the question. Much clinical and laboratory research

remains to be done before the exact influence of these factors is determined.

Much of the clinical rationalizing of this mode of therapy seems to be based on a "*potential acidosis*" in the red septum cases, and a "*potential alkalosis*" in the pale septum cases. Other terms offered are acid or alkali buffer poor and diminution of potential acid or alkali reserve.

The question now arises as to whether this potential "*acidosis*" or "*alkalosis*" is demonstrable by laboratory methods.

Some investigators in the attempt to demonstrate such a change and to better correlate clinical and chemical therapy have measured the ph. of the blood, urine and nasal secretions in their cases. The results have not yielded any positive information. No clues or leads were developed along which to rationalize the acid-alkali therapy.

It occurred to the writer that the failure of previous investigators might have been due to the difficulty in altering the ph. of the body fluids and to the difficulty of interpreting minor changes in such a constant thing as the ph. For these reasons a study was undertaken of the alkali reserve of the blood in selected nasal cases. It was thought that any change in acid base equilibrium might more easily be demonstrated by measuring the changes in the alkali reserve of the blood plasma. The method used was the determination of the CO₂ combining power of blood plasma as described by Van Slyke. The nasal cases were chosen and classified by clinical diagnosis and color of the nasal mucous membranes. Insofar as the investigations did not yield any positive results, it will not be necessary to go into any great detail in describing the conclusions reached.

Some fifty-four cases were examined. They were classified into six groups, according to clinical diagnosis and color of nasal mucosa. The following chart illustrates the small average variations within normal limits.

GROUP CLASSIFICATION	No. of Cases	Average Per Cent CO ₂ for Group	Highest Per Cent in Group	Lowest Per Cent in Group
Chronic purulent sinusitis				
Mucosa red	16	60.4	67	53
Hyperplastic sinusitis (no pus)—Mucosa red	11	59.6	67	46
Allergic rhinitis (mucoid)				
Mucosa pale	6	62.3	69	55
Allergic rhinitis (no secretion)—Mucosa pale	6	60.2	66	55
Combined allergy and sinusitis	9	57.5	69	52
Acute rhinitis.....	5	61.9	67	57

Van Slyke gives as normal variations anything between .55 and .75 c.c. of CO₂ bound by 100 c.c. of plasma.

The normal for the apparatus used in these experiments is thought to be slightly lower than this, *i. e.*, 50 to 70, giving 60 as the mean average. It will be noted from the chart that each one of our group averages is close to this figure. Thus we find that the results are not in accord with the clinical assumptions that a red nasal mucosa with pus is indicative of a potential acidosis in the blood, or that conversely a pale mucosa is indicative of a potential alkalosis.

Negatively, it may be deduced from the experiment that the alkali reserve of the blood remains within normal limits regardless of the color of the nasal mucosa. We had hoped that our experiment might show some indication even within normal limits, of a tendency toward a low CO₂ in the red mucosa cases and a high CO₂ in the pale mucosa cases. Our results, however, do not warrant such a deduction.

In concluding, it may be said that while clinically empiric treatment of nasal affections may be beneficially based on the color of the nasal mucosa, the benefits are not because of any direct relation on the acid alkali equilibrium of the blood. The suggestion is presented that the benefit may be due to some concomittant local changes when the attempt is made to influence the blood acid base equilibrium. The benefit may also be due to some unknown factors which have some relation to the acid base equilibrium, but are not reflected in the blood determination.

The writer wishes to express his thanks to Miss D. Huthsteiner and Mr. Irving Somogyi and the Laboratory Staff of the Jewish Hospital in St. Louis for their co-operation in the experimental part of this paper.

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Puschkin, in the *Zeit. f. H., N. u. O.*, 32:329, 1932, writes on the "Treatment of Chronic Otorrhea by Zinc Ionization." He recommends this form of treatment as being one of the simplest, both for office and hospital use, and claims that he has had good results in about 80 per cent of his cases. He places the method first in his armamentarium of treatments for chronic running ears.

KELEMEN.

Hempstead, of Rochester, Minn., in the June 25, 1932, issue of *The Journal A. M. A.*, reports three cases of bullets in the ear. The social history of his first case is probably more interesting than the scientific data and is very much worth while reading. The author's cases show that these foreign bodies may remain for a long time close to or in the middle ear before causing symptoms. In all of his cases small calibre bullets were found. Removal of the bullet and radical mastoidectomy produced good results in all of these cases

Boland, in the *Zeit. f. H., N. u. O.*, 30:339, 1932, describes the blood picture after surgical intervention, especially following tonsillectomy. He found a postoperative leukocytosis which usually disappeared in from three to four days. There was a light shifting to the left, as evidenced by six to eight stabs. In cases of impending complications the blood picture gave warning one or two days before the clinical signs. The severity of the complications paralleled the regenerative changes in the blood. He remarks with special emphasis that in most of his cases of chronic tonsillitis before operation he found some increase in lymphocytes. In conclusion he remarks that in serial studies of these cases a change in the blood picture should always be considered as only one symptom among others of the general clinical condition.

KELEMEN.

THE NEW YORK ACADEMY OF MEDICINE.

SECTION OF OTOLARYNGOLOGY.

Meeting of Feb. 17, 1932.

Classification of Immunity. Dr. Ward J. MacNeal.

Immunity is that condition of a living organism which enables it to escape without contracting a disease, when fully exposed to conditions which ordinarily give rise to that disease in other individuals. Immunity may depend upon several different factors or upon only one of a great variety. In general, it depends very largely upon those mechanisms which have to do with the struggle for existence between living organisms. In some instances these mechanisms are merely protective, as, for example, a peculiar anatomical structure which renders invasion by a particular parasite quite impossible. Or it may depend upon peculiarities of chemical constitution which do not furnish to the invading parasite conditions suitable for its existence. In other instances the parasite is able to grow in the body of the host but the host is able to take care of the situation without suffering any great inconvenience and there thus arises a condition of commensalism. These various mechanisms and still others will need to be considered at a later time.

Obviously any attempt at classification of immunity is necessarily artificial and the classification finally decided upon will depend very much upon the point of view. As a general rule, however, it seems well to recognize a distinction between natural immunity which exists in the individual as a part of his birth-right and the acquired immunity which develops during the lifetime of the individual, apparently as a result of certain experiences through which he has passed. In the consideration of natural immunity one is at once inclined to pay attention to immunity which exists in certain species of animals, in contradistinction to other species of nearly related animals. Such an immunity will be designated as the immunity of species. When the particular animal possesses a body, a structure which is peculiar, or possesses a body temperature which is unfavorable to the growth of parasites, one may easily understand how it escapes invasion by such parasites. One could hardly expect the tubercle bacillus of man, which appears incapable of growing below a temperature of 35° C., to develop in the bodies of frogs and fishes in which the body temperature is for the most part much lower. It would appear that the immunity of the cold-blooded animals to many of the parasitic diseases of the mammals depends essentially upon this body temperature. In other instances it is possible to recognize a correlation between immunity to disease and the food habits of the particular animals. Those parasites which are conveyed from animal to animal only in the flesh of some animal serving as food for another will obviously not easily enter the bodies of the herbivorous animals. Possibly this difference may come about as a result of adaptation through many generations. However, it is necessary for us to recognize that there are instances of species immunity for which we find no adequate explanation. Certain infectious diseases of man are conveyed to animals only with the very greatest difficulty and in some instances it has so far been quite impossible to cause the parasite of certain infectious diseases of man to develop in animals. The gonococcus is an outstanding example of this peculiar adaptation to the human organism.

Within the same species of animals one recognizes also racial differences in susceptibility to disease. The pure bred dairy cattle are universally recognized as more susceptible to tuberculosis than are the beef cattle. In man it is not so easy to establish definite examples of racial immunity but there are, nevertheless, distinct differences in susceptibility. Perhaps the most outstanding example is found in the relationship to tuberculosis. The pure bred American Indian is perhaps from 10 to 100 times as susceptible to infection and death produced by tubercle bacillus as are the American-born Hebrews. It is possible

that this distinction has been brought about by differences in mode of life which have exposed one race to the tubercle bacillus while the other has been to a large extent without contact with this organism through the generations.

Within the race or even within the same family, however, one has occasion to observe individual variations in resistance to infection, and even in the same individual at different times there can be no doubt that resistance is subject to considerable variation. The recognizable factors which influence individual immunity are, first of all, age, condition of nutrition, fatigue, exposure to excessive heat or cold and chemical poisoning or intoxication. Individual differences in the form of the body which appear to be related to deficient or excessive activity of particular anatomical structures also have significance in relation to susceptibility to disease. Considerable emphasis has been placed upon these constitutional factors in recent years. The precise mechanism by which these various factors influence susceptibility to infection are not well understood. It seems highly probable that the number and the activity of the phagocytic cells in the body, as well as the nature and amount of various chemical substances in solution in the body fluid, play a part.

Perhaps of greater interest to the practical physician are those instances of resistance to disease which are grouped under the head of acquired immunity. This immunity results from some experience affecting the individual during his lifetime which has changed him from an individual who might have acquired a particular disease into a person who is no longer subject to that disease. The event or events leading to this change may have occurred by accident or they have been experienced intentionally. Largely for practical reasons the acquired immunity has been subdivided into active acquired immunity due to actual activity of the body structures of the individual concerned and passive acquired immunity which results from the introduction of material from the outside into the body of the individual so as to render his body resistant to the causes of disease. The common method of acquiring an activity immunity to a disease is by suffering an attack of the disease. Such an immunity has been observed for many centuries and has been the subject of much philosophical discussion. The immunity following an attack of a disease may endure for a lifetime, as, for example, in yellow fever; or it may endure for many years, as, for example, in typhoid fever. In other instances the immunity lasts for only a few weeks, as, for example, in influenza. In smallpox the immunity endures for a great many years following an attack of the disease and various ancient people, recognizing this fact, subjected themselves to inoculations with smallpox intentionally in order to acquire immunity to this well-nigh universal disorder. The introduction of smallpox inoculation into Europe by Lady Mary Worthley Montague, in 1721, marked the beginning of intentional immunization against infectious disease in the western world. The possibility of acquired active immunity without suffering an attack of a disease was first demonstrated by Edward Jenner. He was able to show that the inoculation of a relatively mild disease, cowpox, into man is followed by a period of resistance to the more severe infection, smallpox. Jennerian vaccination for the prevention of smallpox has been very extensively employed throughout the civilized world and has been a subject of controversy for many decades. The subsequent observation by Pasteur that altered living cultures of bacteria may be injected into the body without producing a typical attack of the disease which fully virulent organisms ordinarily cause and that following this experience the body possesses in some instances a resistance to the fully virulent microbic virus has opened up a wide field of application of the principle of vaccination. The use of these altered or killed bacterial cultures is now very extensive. It has also been shown, especially by Ferran and Haffkine that the parasites giving rise to certain diseases may be introduced into the body along unusual pathways where they find themselves seriously handicapped and unable to cause the disease. As a result of this experience the body acquires a resistance to the disease. It is evident that there are many peculiar features involved in the production of immunity against the various human diseases and that the rules which are followed in one instance may not be adequate for the production of immunity against another disease. In certain instances it is not even necessary to introduce the parasite, alive or dead. One can attain success

by introducing into the body soluble extracts of the parasite or bacteria-free filtrates of the cultures of the parasite. Of the greatest importance in this category has been the production of immunity against diphtheria by the injection of the filtrate of the culture of the diphtheria organism and the production of immunity to tetanus by introduction of the tetanus toxin into the animal body. In all these instances it appears that certain mechanisms in the living body are set to work in a somewhat exaggerated fashion so that they are able to cope more successfully with the parasites which attempt to enter the body and with the injurious agents which the parasites may produce.

The second large class of acquired immunity is the passive acquired immunity. This is brought about by introducing into the body some substance which makes the animal body resistant to the disease. Of greatest importance here is the introduction of the blood serum from some other animal which has already acquired an active immunity against the parasite or against its poison. The outstanding example is, of course, the antitoxic immunity which can be passed to the child by injecting into him the serum of the immunized horse. Passive immunity, however, may depend not upon an antitoxic chemical substance in the serum but also upon other agents which may be capable of attacking directly the parasite. The substances are variously termed bacteriolysins, opsonins and agglutinins. They are undoubtedly of the nature of enzymes which bring about alteration in the actual body structure of the parasite, probably by attacking its external envelope. It is also necessary to include in the passive acquired immunity those instances of resistance to parasitism which are due to the presence of other chemical substances, as, for example, a small amount of mercury within the body which may have entered the body accidentally through industrial contact with this metal. Such individuals present a definite resistance to infection with syphilis. Relative immunity against malaria may also be obtained by the administration of small daily doses of quinin. Such protection is of a somewhat different nature than that brought about by the use of blood serum, but it is nevertheless a passive acquired immunity due to a chemical substance from the outside introduced into the body.

The study of acquired immunity has led to the use of the combined passive and active treatment of the individual in order to produce resistance to a disease. Perhaps the outstanding example of success in this field is the immunization of children against diphtheria by administration of a mixture of antitoxic serum and toxic broth filtrate of the diphtheria culture. In some instances, as, for example, in anthrax the immune serum is introduced along with the bacteria.

A sufficiently broad view of the subject of immunity compels one at the outset to recognize that the mechanisms are multiple and that among these mechanisms are many of quite different natures. The first mechanism to be clearly recognized and the one which is of very great importance in many instances has to do with the activity of individual phagocytic cells within the body. Even very primitive organisms have the ability to engulf solid particles in their vicinity and to eat up in this fashion living things which are of somewhat smaller size than themselves. In the human body this ability to engulf smaller particles still remains an important function of certain cells, especially the polymorphonuclear leukocytes which circulate in the blood, the monocyctic cells which circulate in the blood and the endothelial cells which are found in various parts of the body, especially in the reticulum of the spleen, the lymph nodes and in the sinusoids of the liver. Active phagocytosis of parasites is readily demonstrable in relationship to many bacterial diseases. It is, however, quite obvious that in many instances the parasites entering the body are destroyed and completely disposed of without being engulfed by living cells. In some instances these parasites actually pass into solution through a process of digestion in the fluids of the body. The enzymes which bring about such a change are designated as bacteriolysins. In the course of such a digestion many peculiar phenomena are observed. In most instances there is a tendency for the individual parasites to group together and to adhere to each other. This phenomenon is designated as agglutination. In some instances agglutination may be followed by actual solution of bacterial cells. In other instances

it is followed by phagocytosis. There can be no doubt that the various mechanisms which the body employs to destroy the microbes may work together and that in combination they may often be more effective than when working alone. Various names have been given to the different phenomena observed in the course of the combat between the body cells and body fluids on the one hand and the parasites on the other. When these mechanisms are very efficient and the number of parasites entering the body is small these parasites will be promptly disposed of and symptoms of disease will not appear. On the other hand, it must be evident that when the defenses are weak and the number of parasites and their virulence is of a high grade, then the body finds itself at a disadvantage and the disease process may become well developed. Philosophical consideration of the phenomena involved here has led to the development of quite elaborate theories concerning immunity and in some instances there have arisen controversies over such theoretical considerations. It seems hardly worth while for us to discuss these matters at this place. In the combat between the body and the invading parasite or invading material it is possible for a considerable variety of combinations to result and in some instances the attempts of the body to dispose of the invading parasite or its products may not be wholly successful as far as protection of the hosts themselves is concerned. In fact, in some instances the mechanisms which are evidently designed for protection turn out to be a distinct menace because the circumstances are such that they fail to accomplish perfectly their purpose.

It is necessary to recognize that the animal or the human being who has acquired an immunity to a parasite or to some chemical substance is different from what he was before. This altered state of the body has been designated by von Pirquet as a state of allergy. It is probably wise to respect this word allergy and to keep it as a general term for all altered states of reactivity which occur in the human body or in the animal body as the result of the experiences which tend to produce an acquired immunity. In practical affairs, however, the importance of these reactions in relationship to certain chemical substances has led some immunologists in recent years to restrict the application of the word allergy and to employ it only for those states of the human body which cause it to suffer from contact with particular foreign substances which do not ordinarily injure the average person. Doubtless these conditions will be discussed in more detail by those who follow me.

The most important early observation which stimulated interest in this phase of the subject is the well known phenomenon of Theobald Smith. If a guinea pig be injected with a small amount of protein, such, for example, as egg albumin or blood serum of a horse, and then after an interval of 10 to 20 days the guinea pig is again injected with a second dose of the same protein, in an amount of say one-half to 2 gms., the animal usually develops very quickly symptoms of intoxication and usually dies within half an hour. The death appears to be due to respiratory difficulty and there is good reason to believe that spasm of the muscles of the bronchioles is at least an important factor in bringing about this fatal issue. Normal guinea pigs, on the other hand, are able to withstand a very large dose of egg albumin or of serum without showing any toxic effects whatever. It is therefore evident that the small dose of the serum given some time before has brought about in the body of the guinea pig a state of altered reactivity so that he is killed by the second dose. This phenomenon was at first called hypersusceptibility, or anaphylaxis. It is obviously a state brought about by previous experience in contact with the foreign material. In man somewhat similar spasmodic phenomena are observed upon introduction into the body of various foreign substances, especially horse serum, which has been so much used. In these instances the undesirable effects often follow the very first dose of the foreign material. Similar undesirable symptoms appear at later times whenever the body comes into contact with the foreign material to which it is sensitive. There are methods of overcoming this difficulty by introducing minute quantities of the foreign material into the body, thus bringing about a state of desensitization. The technique of Besredka for administering therapeutic serum is of great importance as an example of this principle.

In recent years a new idea has been introduced in regard to the protection of the human body against micro-organisms by the pioneer work of Twort, which has been elaborated by d'Herelle and his collaborators. These investigators have found that the bacteria themselves suffer from diseases caused by filterable viruses which have come to be widely known under the name of bacteriophages, bestowed by d'Herelle. By the use of these agents one is able to bring assistance to the body in its combat against infectious microbes by directing an attack upon the microbes themselves by the filterable agent which can injure them. We have had some experience with agents of this sort and it seems that they offer an important aid in the control of some infections.

The subject of immunology is intimately related to that of practical medicine and it obviously concerns itself with a great variety of procedures which are largely unrelated in their fundamental, physical, chemical and biological features. Anything which can be utilized to ward off disease is a proper matter for study and use by the immunologist. In its broader application to social needs immunology deals with those methods which can be employed to prevent disease in the mass. Here the greatest triumphs have been achieved in relation to smallpox, diphtheria and typhoid fever. The private physician, however, is more intimately concerned with the care of his individual patient and for his special purpose those immunological factors which can be applied in the care and treatment of the individual already sick assume the greatest importance. Here the antitoxic serum for diphtheria still remains the classical example but there are many other applications of immunology which offer valuable aid to the physician.

DISCUSSION.

DR. M. A. RAMIREZ: During the few minutes at my disposal, I have thought it better to discuss with you in an informal manner, the internist's viewpoint regarding disease of the nose and throat, and accessory sinuses in its relation to sensitization rather than attempt a review of theories and references to the literature with which you are all thoroughly familiar and undoubtedly very tired of hearing. There is no longer any question or doubt regarding the importance of allergy in the causation of pathology in the upper respiratory tract. Hay fever, of the seasonable type, due to pollen sensitization, of course we know all about. However, attacks may recur throughout the year, without regard to season, with swelling of the membranes of the nose, particularly the turbinates, causing nasal obstruction, sneezing, serous discharge, and on inspection one sees pale, mushy, boggy, edematous looking membranes; this condition may be more or less persistent with short periods of remission, or it may come and go at irregular intervals, and be of short duration each time; this is a syndrome that we don't know quite so much about. In some cases after careful study we are able to establish a definite sensitization to some substance, such as orris root or a specific dust from one locality or another, to some inhalant or occasionally to a food or combination of foods. At times it is due to inhalation of a mold or fungus or yeast, and again after exhaustive study we may be unable to demonstrate specific hypersensitiveness by our present methods of testing. Some of these cases belong to the group of physical allergy and are due to a hypersensitiveness to cold or sudden changes in temperature, and could probably be called neurogenic and be studied from the standpoint of sympathetic instability. There are, of course, some instances of true pollinosis that are continued throughout the year as the result of secondary infection, and also there are cases presenting this symptom complex that are definitely the result of infection in the nasal accessory sinuses or of infected tonsils. They are difficult cases, one cannot jump at a conclusion, and the only way in which one can accomplish anything is by whole-hearted co-operation between the internist and the otolaryngologist. Regarding infection in the sinuses, I am not in accord with over-enthusiastic allergists who lay claim to sinus disease as belonging to the group of important sensitization phenomena. I do not believe that I have ever seen a case of infected antra or ethmoids that I thought was really due to specific hypersensitiveness alone.

I am not going to discuss the importance of infected tonsils as a factor in nasal disease, because I think that is out of my field and belongs essentially to the otolaryngologist. The importance of infection in the nose and throat,

particularly, the nose and accessory sinuses in bronchial asthma cannot be over-emphasized. Excluding the cases of asthma that can be shown to be definitely due to some specific substance, such as a food or an inhalant, and that elimination or avoidance of this substance causes a disappearance of symptoms and re-exposure causes a return of symptoms, excluding these cases, infection of the nose and throat is by far the most important factor in the etiology of bronchial asthma, and even in the truly specific cases infection in the nose and throat is of tremendous importance. There is absolutely no question in my mind, but that many cases of asthma that are now being treated unsuccessfully could be materially helped if there were thorough co-operation between the internist and the otolaryngologist. I do not mean to imply that there is a deliberate lack of co-operation; I mean that there doesn't seem to be a keen enough appreciation of the need of working together. I think that every case of asthma, as well as every case of persistent nonseasonal vasomotor rhinitis, should be competently studied not by one or the other, but by both the otolaryngologist and the internist. I think that it is a mistake for the internist interested in allergy to depend on his own experience regarding disease of the nose and throat and sinuses, just as I think that it is a mistake for the trained otolaryngologist to conclude that a case is or is not of allergic origin based on the result of insufficient tests often inadequately performed and interpreted by an inexperienced assistant or nurse, without the slightest bit of training in applied immunology.

Before concluding, I should like to say just a word about the importance of the intestinal tract, and also about the sensitization test in general. Intestinal absorption is of great importance in the causation of nasal symptoms. It is well to remember that some cases are not hypersensitive to a specific food, but do show a quantitative intolerance; that is to say, they do not tolerate an excess of carbohydrates or of fat or of protein. In outlining elimination diets for test purposes, it is well to include a diet high in carbohydrates and low in fat and protein, also one high in fat and low in carbohydrates, etc., to determine quantitative intolerance. Regarding the sensitization test, one should not base their conclusions entirely on the result of skin reactions. Often one fails to obtain a reaction to substances which are indeed responsible for the symptoms, and at times one gets multiple reactions to substances having nothing to do with the patient's symptoms. It is unwise to put a patient on a strict diet, eliminating essential foods, without going a step further and establishing a definite causal relationship between skin reactions and the patient's symptoms.

Meningitis Following Acute Suppurative Mastoiditis; Operation; Recovery. Dr. H. Clifton Luke.

M. D., male, age 6 years, was admitted April 24, 1931, to the Otolaryngological Service of the Knickerbocker Hospital with the following history: Six days previously an acute, severe pain in the left ear had developed, coincident with a nasopharyngitis but without any discharge from the canal. After the pain had lasted for three days a myringotomy was done by a general practitioner. On the following day the child complained of headache and some dizziness, accompanied by severe attacks of vomiting. There was a rise of temperature to between 103° and 104°, accompanied by slight chills. These symptoms persisted up to the day of admittance, during the morning of which they were aggravated, and it was then noted that the legs, back and neck were somewhat stiff.

On examination the child was very pale and apparently acutely ill. He lay on his right side in a position of marked opisthotonos, with the knees flexed on the abdomen. His mental state was clear but he was quite restless and every few minutes he cried out as if in sudden pain. Among the neurological symptoms was an active spontaneous rotatory nystagmus toward the involved (left) ear, increased on looking to that side. The head was strongly extended and the neck very rigid, attempts to flex it causing the child to cry out. All the reflexes were increased, with a positive Babinski and Kernig on both sides. The spinal fluid was cloudy and under increased pressure. The cell count was 1,250, with 80 per cent polymorphonuclears and 20 per cent lymphocytes. The sugar test was negative. There was increase in globulin.

A fairly conservative attitude was taken regarding lumbar punctures, only two being done, one preoperative and one postoperative. As a precaution against breaking down any existing barrier through the sudden reduction of intradural pressure, it was considered advisable to remove only about 5 c.c. Through a misunderstanding 50 c.c. were removed on the second occasion, but apparently without any detrimental results.

The blood count showed: Red cells, 3,530,000; hemoglobin, 60 per cent; white cell count, 6,400, with 64 per cent polynuclears. During the first and second postoperative days the white cell count rose to 11,000, with 74 per cent polynuclears, and then gradually returned to normal. Urine was negative throughout, except for a faint trace of albumin and a few pus cells.

There was a thin purulent discharge from the external canal, which was moderately narrowed by edema near the drum. The mastoid was only slightly tender on pressure and no edema was present. The eye grounds were normal. A noise apparatus in the normal ear showed that the cochlea on the involved side was active and the voice, speaking softly, was audible at a distance of two feet. The cold caloric test indicated an active labyrinth.

Two doses of antimeniugococcus serum were given as a precautionary measure since acute meningitis secondary to suppurative middle ear and mastoid infection was fairly definitely established, and Dr. Lewis Stevenson, who made the neurological examination, agreed with this diagnosis. The *modus operandi*, however, was not so clear. The acute labyrinthine and meningeal symptoms apparently directly following the myringotomy and the early presence of a spontaneous nystagmus with dizziness and vomiting suggested the possibility of an accidental invasion of the labyrinth during this procedure. The nystagmus was somewhat atypical, being toward instead of away from the involved ear as might be expected in the case of a definitely established acute suppurative labyrinthitis. It may be noted here that this nystagmus persisted, with slowly diminishing activity, for nearly four weeks.

It was decided not to open the labyrinth, but instead to perform a simple mastoid operation at once. Most of the mastoid cells were found to contain granulations and pus, but definite softening was found in only two locations: a small necrotic area just above the knee of the sinus and another in the forward part of the zygomatic region. In the latter location the inner plate showed definite softening and there were some granulations on the dura. As no sinus tract was visible at this point the dura was not disturbed. The inner plate was removed over a large area. With a flat elevator the dura was lifted off the posterior-superior surface of the petrous bone as far as possible toward the internal auditory meatus and a small folded rubber dam drain was inserted. No pus focus could be determined. A separate drain of the same type was placed in the zygomatic region and a large cigarette drain in the main cavity and the wound was left wide open. Two transfusions were given during the next few days.

Definite signs of improvement were manifest within 24 hours: lowering of temperature from 103°-104° to 100°-102°; cessation of chills and vomiting, together with severe intermittent head pains; marked diminution of opisthotonos and neck rigidity. Kernig's sign was still present but the Babinski was negative. The spontaneous rotatory nystagmus toward the involved ear was less active. Spinal fluid was cloudy and under slightly increasing pressure. Cell count was 400, with 78 per cent polynuclears.

The second postoperative day showed continued improvement, with a temperature of 99°-102°. The patient's appetite returned and he was mentally clear. Opisthotonos had largely disappeared, only a slight rigidity of the neck remaining and this being less painful. Since all signs of intracranial pressure were diminishing it was decided to make no more lumbar punctures. No organism was identified from the spinal fluid at any time.

Dr. Lewis Stevenson's neurological report at this time was as follows: Child's condition seems to have improved greatly. Has no neurological signs except those of a meningitis. If these increase would advise lumbar punctures, repeated daily if necessary. Believe the findings are those of a true meningitis from a mastoid infection.

The cochlea continued active, as shown by regularly repeated tests with a noise machine in the normal ear. Labyrinthine tests by irrigating the wound with cold, sterile water were made for several days with a response that indicated an active but somewhat irritable labyrinth.

On the third postoperative day the opisthotonos had entirely disappeared, the neck was a little stiff but only slightly uncomfortable when actively moved. Kernig's sign was still present. The latter disappeared the fifth day and after that time the only neurological sign was a fine horizontal nystagmus, occasionally rotatory, always toward the side of the lesion. The middle ear was dry on the sixth day and remained so.

On the seventh day the temperature suddenly ran up to 103.3° . Blood count was 7,500, with 54 per cent polymorphonuclears. The child was restless and complained of headache. Sedatives were administered and a high enema given. Temperature returned to normal on the following day. On the ninth day the temperature rose rapidly to 104.3° with no untoward symptoms except moderate headache. Blood count and urine examination negative. Blood culture negative. Nothing noted in the eye grounds. Neurological findings unchanged. With the prompt return of the temperature to normal there were no further disturbing features during recovery. The red cell count was 3,000,000, with 60 per cent hemoglobin. After a second transfusion convalescence continued uneventfully and the patient was discharged at the end of the fourth week.

The wound had healed very irregularly, due to the wide open drainage, so in order to correct this condition a small plastic procedure was carried out about a week prior to discharge. The posterior wound healed slowly but completely and at the end of the nine months the child has had no further symptoms referable to the ear.

The principal points of interest in this case are: 1. The short middle ear history; 2. definite meningeal symptoms developing by the fourth day; 3. the fact that these symptoms almost immediately followed a myringotomy; 4. the indefinite signs of mastoid involvement at the time of the operation, whereas 5. there was definite evidence of labyrinth irritation, as shown by the vertigo and vomiting, accompanied by an active spontaneous nystagmus; 6. the rapid subsidence of meningeal and labyrinth symptoms following the exploratory mastoid operation; 7. negative cultures from the spinal fluid, the last an important and hopeful sign from the first.

This case should probably be classified as a circumscribed form of purulent meningitis with perilabyrinthitis, secondary to middle ear and mastoid infection. Early operation undoubtedly prevented a diffuse leptomeningitis.

DISCUSSION.

DR. J. J. KING: This case should not be allowed to go into our records as a case of otitic meningitis cured by mastoidectomy, as the title on the program indicates. There is no evidence of a true meningitis as no organism was found in the spinal fluid at any time. All experienced otologists have seen such cases of meningeal irritation during acute otitis and mastoiditis, but we never call it true meningitis unless we find an organism in the spinal fluid. I have seen perhaps 50 such cases and all have recovered; on the other hand, whenever some organism has been found in the spinal fluid indicating a true meningitis, all have died.

I believe this case should be reported as mastoiditis with meningeal irritation, with recovery following mastoidectomy.

These remarks on Dr. Luke's case, I assure you, are made in this scientific form merely for the sake of establishing the truth in our records. There is intended no personal criticism or animosity.

DR. C. H. SMITH: I think that this is just a question of terminology. It seems to me that I would classify Dr. Luke's case as one of serous labyrinthitis, complicated by protective meningitis. I don't think that any case that showed 1200 cells in the spinal fluid could be set down as a case of simple meningeal irritation. All the symptoms, opisthotonos, etc., to say nothing of the number of cells and the extreme sickness of the child, would indicate the seriousness of the condition.

This, however, would constitute perfectly a protective meningitis or meningitis sympathetica, a localized process giving all the signs and symptoms of so-called purulent meningitis, excepting that micro-organisms are absent in the cerebrospinal fluid. I congratulate Dr. Luke on getting through with the case so nicely.

DR. H. C. LUKE: Culture from the mastoid showed short-chain streptococci. I tried to make it clear that this was a case of circumscribed meningitis, not diffuse suppurative meningitis as Dr. King seems to understand, and I believe that a diffuse meningitis would have probably followed if operative interference had been delayed.

A prompt exploratory mastoid operation in such a case is justified, even without clear indications from the standpoint of mastoiditis, in the hope of draining the focus that is somewhere feeding into the cerebrospinal fluid, toxins and probably bacteria at intervals. We can thus greatly assist the protective mechanism of the host.

It is a question whether the terminology should be decided on the basis of a spinal fluid culture alone, rather than on a broad consideration of all the findings. Personally, I do not feel that the term "meningeal irritation" describes any definite lesion or has any scientific value.

As I recall it, Dr. Eagleton reported some recoveries in which the spinal fluid culture was positive, and Dr. Ross had a case of otitic meningitis with positive culture of streptococci in the spinal fluid, at St. Luke's about a year ago, which recovered. I believe there were recoveries in two other similar cases on Dr. Bower's service at Bellevue.

I do not feel that the truth of our records will be violated with the diagnosis as made in this case report.

Otolaryngological Manifestations in the Adult. Dr. Gerald Pauley.

This is rather a large subject to discuss intelligently in such a short time and I shall attempt to only touch the high spots as they appeal to me.

My remarks are based on findings in the Post-Graduate Hospital. Hay fever and asthma clinic from November, 1927, to February, 1931—a period of over three years—and will deal with seasonal hay fever and bronchial asthma, the best examples of allergy, leaving out such manifestations as angioneurotic edema, eczema, etc.

The symptoms of hay fever are watering and itching of the eyes and nose, sneezing and itching of the throat. When these symptoms are present in an individual at a definite season each year the condition is defined as seasonal hay fever, and the cause is nearly always some pollen which has been inhaled. The local appearance in the nose and throat is well known, the membranes of the nose are very much swollen, with passive engorgement, copious, watery nasal discharge.

The treatment of the sufferer in an acute stage from a laryngological standpoint is practically hopeless. Local applications may relieve for the space of a few minutes, and sprays at home only aid to a slight degree. Cocain sprays in the patient's own hands should never be prescribed in however slight amounts. Argyrol or ichthyol and glycerin packs appear only to aggravate. The use of electrocautery on different areas in the nose, especially to the septum, offer little hope of relief. Much can be done to alleviate symptoms before the seasonal attack by surgical interference if there are diseases or deformities which justify treatment on other grounds than for hay fever. I do not know of a case of an inveterate well marked case of hay fever to be cured by intranasal operation.

The so-called perennial hay fever victim, a fairly recent term, can best look for relief from the findings of the cutaneous tests. In a large percentage of cases it is impossible to differentiate between perennial hay fever and vasomotor rhinitis.

I have also found that cases of nasal polypi are often overlooked by the allergist. The symptoms are practically the same—sneezing, poor nasal breathing, discharge, lacrimation, etc. Actual identification clinically of the polyps is the sure way to identify.

Most hay fever and asthma patients have diseased tonsils but tonsillectomy, unfortunately, holds no hope of cure. It is true that the removal of tonsils in the adult reduces the number of colds and increases the general body resistance, but where one would hope for a big improvement, the results turn out to be very disappointing. Adenoidectomy in the asthmatic child is another matter and the good results from this procedure are often astounding.

The relationship of nose conditions to bronchial asthma opens up a field of wide controversy and the arguments for and against are at two extremes, especially in the matter of nasal surgery.

Some rhinologists claim that nasal surgery should never be done; others claim marvelous results with interference in every region of the nasal cavity, such as the upper and back part of the septum, the ethmoid region, hyperesthetic areas on the anterior tips of the middle and inferior turbinates, points of contact between the septum and the outer wall of the nose, all of the sinuses, and the sphenopalatine ganglion have each been referred to as the most important point.

A reflex path from the nasal chambers to the lungs is recognized. I have found that in 90 per cent of cases any surgery done to the nose will give brilliant temporary results. A patient who is almost in collapse from repeated asthmatic attacks will, even after a minor nasal operation, often have complete comfort for weeks, then, unfortunately, the symptoms often reappear as severe as ever.

When I first started in this work, I set out with a determination to find out particularly the relationship between antritis and bronchial asthma. Anyone is apt to become too enthusiastic and be too keen on their results but, to my mind, the diseased maxillary sinus shows the greatest connection as a causative factor of bronchial asthma than any other part.

Any case that showed even a so-called membranous thickening of an antrum by X-ray, even without signs of sinusitis, was washed out and it has been really gratifying to find improvement in a patient, and in an odd case apparent cures after an antrum irrigation which showed a few particles in the return.

From the records of over three years I have studied 100 asthmatic cases which had antritis confirmed by X-ray and then irrigated. They aggregated a total number of washings of 460, or 4.6 irrigations to a patient. I found that one in 16 had antritis, or 6.2 per cent. That of the entire clinic of hay fever and asthma clinic, 1.3 per cent had antritis. This is a very conservative estimate as many were never referred from the allergy side, and others could not afford the X-ray. The percentage of antritis to asthma cases alone would be much higher.

In this period, from November, 1927, to February, 1931, there was a total of visits and revisits to the clinic of 22,670, and those treated and examined laryngologically to the number of 2,258. Thus we have 10 per cent of the clinic under nose and throat treatment and it demonstrates how futile it would be to run an allergy clinic of any size without an ear, nose and throat department intimately connected with it.

May I cite one case? A colored female, age 37 years, was diagnosed as a severe case of bronchial asthma of four months' duration. I first saw her in the clinic of 1929. She had pus in the left side of the nose. X-ray showed that she had a left maxillary sinusitis. After the first antrum puncture her asthmatic attacks disappeared, antrum irrigations not keeping up with the infection. I did an antrotomy and continued washings until just recently. She still has pus from the antrum and when it fills up she feels as if the asthmatic attacks are coming on again, but after the antrum is washed out the symptoms disappear. She refuses a radical antrum operation, which should be done. I present this case to show that she still has antritis, but as long as the antrum is kept clean she is free from her asthma, and this is a period of over two and one-half years.

Consideration of Immunology in Its Relation to Otolaryngology. Manifestations in Children. Dr. Marshall C. Pease, Jr.

It is not our purpose in this brief discussion to more than mention all those allergic conditions which may be included as the result of inhalation of animal emanations, pollen, dust and powder or of those conditions which follow the

ingestion of foods and drugs. It is widely recognized that various forms of coryza, asthma, urticaria, erythema, angioneurotic edema and gastroenteritis may be dependent upon the inhalation of a great variety of substances or the ingestion of particular foods. All of these conditions appear in very young children and all may be difficult of diagnosis and treatment. It is desirable to a great error in judgment, not only on the part of the pediatrician but also in the group of the otolaryngologists. There are many definitions of allergy and there appears to be considerable confusion as to exactly what is meant by the term. The definition which I have accepted is that it is a clinical change in the capacity of the organism to react to an infection or an intoxication following a primary infection; it may be in the direction of immunity or of increased susceptibility. It is associated with anaphylaxis. The form that I wish to discuss is that type of allergy which follows the absorption of bacterial protein from a focus of infection. This is a sad chapter, both from the standpoint of the pediatrician and of the otolaryngologist.

The great average of the otologists still feel that it is necessary to have a temperature, tenderness or swelling behind the ears and a purulent discharge from the ear in order to make a diagnosis of mastoiditis in an infant. He has not yet discovered that all of these symptoms may be absent and that the baby may still die from dehydration, evidence of indigestion and constant loss of weight and acidosis which find their origin in a mastoiditis. Through the years as far back as I have a medical memory it has been noticed and remarked on that gastroenteritis and atrophy were often associated with an otitis media; and the pathologist found such an association so frequently that he ceased in most instances even to call the attention of the attending physician to his oversight in diagnosis.

Instead of looking upon the ear as the original focus of infection it has been regarded as a minor secondary infection. It is time to put the horse ahead of the wagon instead of behind it in this matter. It will perhaps be considered an impertinence in this body for a pediatrician to offer the suggestion that small babies may have a mastoiditis which will surely and inevitably cause death without having redness of the drums, or any purulent discharge or any tenderness and very little if any temperature. On the whole, the sign of greatest value is a sagging or bulging of the posterior-superior wall of the canal. A proper conclusion in many of these cases will only be arrived at by sympathetic exchange of ideas across the bed between the pediatrician and otologist. A myringotomy will not cure many of these cases. Any evidence of otitis media, no matter how obscure, must be not only followed up but completely cured in all cases showing loss of weight, temperature, dehydration and the appearance of intoxication.

Whatever has been said about the ears is doubly true when it comes to the sinuses. The average rhinologist does not know that the maxillary sinus and ethmoid sinuses may have a clinical significance at birth; and that the sphenoidal sinus may have a clinical significance at 6 or 8 years and the frontal sinuses at about the same age, though Killian has reported an operation on the frontal sinus at 15 months. In sinus diseases as they occur in children there may be no nasal discharge, and superficial examination may show no pathological condition. Even a more thorough examination may fail to make the diagnosis and yet frequently these children at autopsy present definite and unmistakable signs of infection of the sinuses. So far as infants are concerned, from the pediatric standpoint, the chief difference in the general effect between mastoid and sinus infection is in the rapidity of onset and progress. Sinus infections usually produce their effects more slowly and are longer drawn out than is the case with mastoid infections. In both instances the more serious symptoms are usually preceded by a period of little fever and stationary weight. The upper respiratory infection is seldom obvious, while the gastrointestinal symptoms and loss of weight are prominent.

As the child grows older the sinus infection becomes relatively more important in the diagnosis of serious chronic conditions. There is much evidence that rheumatism, chorea, nephrosis, pyelitis, deforming periarthritis, anemia, malnutrition, chronic digestive disturbance and many other obscure conditions find their cause in this or related foci of infections. It is not claimed for one

moment that all cases such as are cited above have a single etiological factor, but it is demanded that a careful analysis be made of the entire situation by the otolaryngologist in all disease of this general type.

It has long been recognized that the most striking feature of the upper respiratory infection is their obscurity. The general effects as indicated are more serious than the original foci would seem to warrant; and this fact probably explains why they have been regularly overlooked and their importance deprecated. The mother who announces that her child has "a cold in its bowels" has usually a better conception of the condition than have most pediatricians and otolaryngologists. The stationary weight or the loss of pounds in weight with dehydration following an insignificant appearing infection of the middle ear and the extraordinarily rapid return to health with the improvement or cure of the middle ear disease presents a problem which is not explained by the local conditions nor is it due to a widespread infection through the body or entirely to a spread of the local infection along the gastrointestinal tract. It has appeared to us that the true explanation lies at least partly in the field of bacterial allergy. In the course of infection in which bacterial foci are formed there follows the development of a hypersusceptibility which is seemingly distinct from protein anaphylaxis and which in some instances at least can be determined by intradermal skin reaction. It has been suggested that such allergic states are nothing more than a rapid mobilization of the same forces which operate in the normal animal, only that the response is with an energy far more strenuous than the normal reaction to the attacks of the specific invader. However that may be, we recognize in these infections centering about the throat, nose and ears widespread effects and a diversity of symptoms, such as stationary or loss in weight, dehydration, irritability, lack of progress in school, absence of initiative, depression of cerebration and memory, hypersensitiveness and those more obvious conditions, such as loss of appetite, malnutrition, cyclic vomiting, deforming peri-arthritis, anemia and various kinds of skin lesions belonging to the general group of acro-dynia.

A distinction is here made between bacterial allergy and that form which is commonly classified as hyposensitiveness or idiosyncrasy. There still remain unbridged gaps in our knowledge between these conditions and, while in the final analysis, it may be proved that they are similar reactions, it is yet wise for the present to maintain the distinction in terms. After all, the common interest which the pediatrician and the otolaryngologist have in these conditions, aside from those acute infections which are a direct menace to life, lie in this group of obscure infections in which bacterial allergy plays a large and predominant part.

I may be excused from discussing that less interesting group of cases which are so often called the hypersensitiveness or idiosyncrasy or, more simply, as allergy. They are well recognized and the hereditary element is so well appreciated that eczema in the great grandfather is sufficient to condemn any infant to the allergic state. I have chosen a more obscure and, from the standpoint of life, a more important. I make a plea that these cases be studied with an open mind and with a greater understanding. Not every feeding case that develops an otitis media needs to have his mastoid opened and no child should have his sinuses punctured without a careful consideration of all the factors involved. There is room here for a great advance in diagnosis and treatment; and a constant intimate exchange of thought and observation between the otolaryngologist, the pathologist and pediatrician will be of benefit to everyone, including the patient.

Specific Therapy in Allergic Nose and Throat Conditions. Dr. W. C. Spain.

In order to discuss the treatment in bronchial asthma and in allergic coryza, both seasonal and nonseasonal, the varieties of clinical hypersensitiveness with which the rhinologist comes in most frequent contact, it is necessary to classify the cases upon an etiologic basis.

According to their causes, therefore, it is possible to divide these hypersensitive cases into three groups. In the first and largest, comprising among the asthmatics some 60 per cent of the total, are placed those cases that are truly

hypersensitive. These are the cases that have an antecedent or collateral family history positive for hypersensitiveness, have the onset of clinical symptoms at an early age, in most cases before 30 years, and demonstrate positive skin tests by the scarification or intracutaneous technique. With but few exceptions the causative factors can be determined, whether they be air-borne, inhalant substances, such as pollens, dusts or animal emanations; or foods; or drugs. In the treatment of these cases which are so strictly of a hypersensitive nature, the excitants so demonstrated must be removed from the patient's environment or, if more practical, the patient must be removed from their environment. In addition, systematic injections with gradual increase in dosage are given of the extracts of the exciting substances, inhalants, or even foods, indicated as specific factors by test, and verified by clinical history. In this manner a decrease in the patient's degree of hypersensitiveness to the specific excitants of his asthma or coryza can be produced. Complete desensitization is very rare, usually only a partial desensitization or hyposensitization being possible. Such treatment as outlined for these purely hypersensitive cases is comparatively simple, both in idea and in execution, and the results are usually satisfactory.

In the second group are placed those cases of asthma and coryza that are negative by cutaneous test. Comprising some 30 per cent of the total, these cases usually present a negative family history and have the onset of clinical symptoms, in most instances after the age of 30 years. To even the strongest of tests the skin is inert, and rightly so, since usually the cause here is found to be a chronic infective process, located in the upper respiratory tract.

Occasionally the primary focus is in the bronchial tree but usually it is in the paranasal sinuses, the sinus infection preceding the asthmatic or even the bronchial symptoms often by many years.

The cases in this group, above all others, require the aid of the rhinologist in demonstrating and in treating the exciting infection. It is not within my province to dictate to you, as rhinologists, how to treat cases of sinus disease. Permit me, however, to call your attention to the very evident fact that in the group under discussion, that is, the group of infective asthmatic cases, there is present an element that separates them from all other chronic sinus cases—the element of hypersensitiveness. This hypersensitiveness to infection must be taken into account by the rhinologist in his treatments. Three facts, first recognized in the study of the purely hypersensitive cases described in group one, the pollen, dust and food cases, are equally pertinent here. They are: first, the regular occurrence of an exaggerated response with severe asthmatic or coryzal symptoms, to minute amounts of the excitant; second, the frequent continuation of symptoms while any trace of the excitant remains; and third, the general failure of hyposensitizing treatments as long as the patient is exposed to appreciable amounts of the excitant.

These facts, as related to the second or infective type of cases, signify: first, that paranasal foci of infection, so slight as not to warrant attention in the ordinary sinus case, may be the cause of severe symptoms in the asthmatic hypersensitive to infection; second, that any vestige of infection left after any sinus operation may be responsible for unabated asthmatic symptoms; third, that such patients must remain under the care of the rhinologist for many months for the treatment of any residual infection. The treatment then in these infective cases is essentially the responsibility of the rhinologist. General medical measures to increase the resistance should be instituted, and vaccines, stock or autogenous, should be tried, although their use has often been disappointing.

In the third group of hypersensitive cases are placed those that combine many attributes of both group one and group two. The hypersensitive state characteristic of group one can be demonstrated here by the presence of cutaneous reactions upon test. The infective state characteristic of group two can also be demonstrated, but there is a very significant distinction as to its occurrence in this group. Whereas, in group two the infection was the cause of the asthma and the coryza, often preceding them by years, in group three the asthma and the coryza appear first, and are themselves responsible for the later appearance of the sinus condition.

The allergic edema of the nasal and sinus membranes in these cases resulting from the continual irritation of the excitants, such as pollens, dusts, feathers,

etc., unless checked by treatment grows more pronounced and stubborn with fewer and fewer remissions. Proper ventilation and drainage becomes increasingly difficult and in time an infection develops with a chronic sinusitis resulting. These cases require the combined efforts of both the rhinologist and the allergist. Any treatment that recognizes the hypersensitive factor alone or the infective factor alone is sure to be unsuccessful. Every effort should be made to determine the specific excitants responsible for the hypersensitive element and proper treatment instituted. After it is apparent that the full benefit of this specific treatment in congestion has been obtained it is often necessary for the rhinologist to establish proper drainage and ventilation. A reversal of this procedure often results in unnecessary nasal surgery. For example, children with chronic sinus infection are often found to have this condition superimposed upon a sensitiveness to pollens, dust or feathers. In such cases, the underlying sensitiveness should always be determined and recognized in treatment before any surgical procedure is adopted. In every case of chronic sinus infection in children an underlying hypersensitiveness should be suspected.

To summarize then, let us reconsider for a moment the treatment in these three groups of asthmatic and coryzal cases.

Group one, the largest, is comprised of hypersensitive cases only in whom no nasal pathology exists other than an allergic edema and in whom, therefore, the rhinologist has no direct interest. The treatment, based upon cutaneous test, consists of removal of the cause and of specific protein injections.

Group two, the next largest group, is comprised of cases of a strictly infective origin, the asthmatic or coryzal symptoms being the result usually of a sinus infection. This group, therefore, offers a problem to the rhinologist primarily, who must, however, bear in mind the fact that the hypersensitive element requires a modification of the ordinary rhinological procedures.

Group three, the smallest, is also the most complicated, possessing many characteristics of both group one and group two. Since both hypersensitive and infective elements are present, the collaboration of the allergist and rhinologist is necessary, the independent efforts of neither one being sufficient for a successful result.

Nonspecific Therapy. Dr. Blake F. Donaldson.

If no specific emphasis is laid on any particular branch of internal medicine, one cannot fail to be impressed by the large percentage of office patients with disorders that do not seem to depend upon any known pathology. Close study of family and personal histories suggests that many of these disorders depend upon an inherited hypersensitive state.

Apparently in allergy, the shock tissue is most commonly located in the mucous membranes, the skin and in nonstriated muscle. We are beginning to include, because of their frequent association and occasional response to treatment, many common disorders in the allergic group. Bronchial asthma and hay fever head the list. But because of their relative frequency, other ailments are more important to the internist. Urticaria in its various forms, eczema, bilious attacks, most headaches and especially migraine, food and drug sensitivities, styes, marked susceptibility to common colds, canker sores, the type of irritable gastrointestinal tract so commonly mis-called nervous indigestion or colitis, and dysuria with frequency of urination in the absence of infection, are now considered by many to be allergic manifestations.

There will be less agreement on including sinusitis in this group, but I think it belongs there, as well as the transient and often unilateral scleral or conjunctival congestions with itching eyelids. Comedoes develop in adolescence and often persist into adult life. Peripheral neuritis for which no explanation can be offered, or Bell's palsy may suddenly develop. Some of the epileptics with grand mal have many allergic manifestations. Complete heart block may develop after sudden shock. Some gastric and duodenal ulcerations possibly develop as do canker sores. Many constantly coated white tongues clear up under antiallergic therapy. Certain aspects of acute rheumatic fever and scarlet fever suggest bacterial allergens at work. In women the vulnerability of mucous membrane and nonstriated muscle extends to the pelvic organs. Leukorrhea and dysmenorrhea are common among them.

Essentially the process seems to be a body irregularity, which is often associated with a mental irregularity. Generally, the patients seem to like treatment that is accorded with emphasis, making it difficult to evaluate any treatment. To me it seems that it is mainly for this group that nasal hysterectomies, abdominal belts, enemas and colon irrigations, yeast and lactic acid intestinal implantations, electrotherapy, various dietetic fads and operations for sacro-iliac slip or strawberry gall bladders have been devised. Or they may be told that they have a streptococcus infection, or autointoxication, or low blood pressure. Incidentally, it is rather rare to see allergy with a blood pressure above the limits of low normal.

Up until 1927 an effort was made in a group of 3,390 office patients to treat them all with what were thought to be good hygienic measures. An attempt was made to get them normal weight. They were rather routinely, when able, required to walk outdoors every day for 30 minutes without stopping. This would seem to be a fairly minimal requirement of the healthy adult who wishes to maintain health. Eight hours' sleep, an orderly routine, frequent short vacations when possible, and reasonable freedom from social, economic and physical stress were emphasized.

But with these measures a certain percentage of the patients with allergic manifestations were unimproved. Elimination diets, as ordered, failed to help many of them. The common forms of allergy do not seem to have skin reagins. This militates against skin testing for closer diagnosis.

Since 1927, nonspecific desensitization, or irritation, was tried on 417 adults. In all, 8,292 injections have been given. To these patients a very detailed questionnaire was sent; 128 women and 57 men answered it.

They had been treated by intramuscular injections of boiled milk three times a week for from six to eight weeks. At first the number of 24 injections was adhered to but as it became apparent that most of the very few general reactions came after the eighteenth injection, the number was reduced to that figure. Happily, true milk sensitivity in adult life is very rare and it seems to be fairly easy to regulate the dose, depending upon the severity of the local reaction. Immediate general reactions numbered 12. These seemed to require the use of adrenalin for control. There were no fatalities. Immediate general reactions were about evenly divided between bronchospasm and lightning pains in the back and legs. One case developed a tremendous erythema involving the whole body.

At the start one patient inadvertently had a dose of boiled milk injected where there was residual skin redness from a preceding injection. A sterile abscess, resembling somewhat a huge bedsore, developed. It was due, I believe, to a death of tissue rather than to infection. At times the local reactions were very extensive. Seldom were amounts larger than 2 c.c. given, as that seemed to be enough to give occasional local irritation throughout the course.

The first intramuscular injection was preceded by an intradermic test. The site of injections alternated between the right and left deltoid and right and left thighs. The decanted bottom third of a pint of unmixed milk was boiled 10 minutes and used. A new lot was prepared every day. The hypodermic syringes used were washed and cleaned in a solution of 5 gm. of technical potassium dichromate in 500 c.c. of commercial sulphuric acid. They were then washed in tap water and distilled water.

The following information was elicited from the 185 questionnaires returned: 62 per cent of the patients felt themselves improved by the treatment; 29 per cent felt themselves unimproved; 9 per cent were in doubt; 46 per cent had suffered from bilious attacks in childhood; 62 per cent complained of periodical headaches; 22 per cent had had eczema at some time during their lives; 44 per cent had had urticaria in some form; 34 per cent had had acne; 36 per cent had had comedoes; 36 per cent had had styes; 55 per cent were very susceptible to colds; 38 per cent had been treated for sinusitis; 19 per cent had been hay fever victims; 15 per cent had had bronchial asthma; 48 per cent complained of canker sores; 40 per cent thought themselves sensitive to certain foods; 59 per cent had irritable stomach or intestines; 30 per cent had noted a more or less constantly coated white tongue; 14 per cent thought that they had had

bladder discomfort when their urine was clear; 31 per cent had suffered from neuritis.

We were interested in securing some other, possibly irrelevant evidence: 19 per cent were markedly susceptible to poison ivy; 46 per cent felt badly in very hot or very cold weather; 9 per cent had had acute rheumatic fever; 23 per cent had had scarlet fever; 20 per cent had had diphtheria; 25 per cent had had pneumonia; 55 per cent of the women complained of leukorrhea; 31 per cent of the women had had excessively painful periods.

These 185 patients have been observed for an average period of 15 months after completion of their treatment. In the whole number of cases treated most of the objective improvement occurred in the group of headaches and acne. Susceptibility to colds and sinusitis was decreased about 40 per cent. Eczema was the least improved.

In conclusion, it would probably be well worth while in history taking to record the various allergic manifestations encountered. There may well be some great underlying condition which makes for disease susceptibility and which could be controlled by breeding. The treatment with injections of boiled milk is possibly nothing more than a treatment accorded with emphasis. But it seems to have great value in some cases. In treatment, a 30-minute continuous walk outdoors every day, is the most effective agent used.

BOOK REVIEWS.

A Radiological Study of the Paranasal Sinuses and Mastoids. Amédée Granger, K.C.B., K.C.I., M.D., F.A.C.R.; Professor of Radiology, Louisiana State University Medical Center; Director of the Department of Radiology, Louisiana State Charity Hospital. 186 pages with 113 illustrations. Philadelphia: Lea & Febiger, 1932. Price \$5.50 net.

This short text is of great interest to the otolaryngologist insofar as it minutely describes the technique of the various positions for taking X-rays of the sinuses and mastoids. While the clinician need not be conversant with all this detail it is a good thing to have the reference handy both for instruction and for suggestion to the Roentgenologist in cases where minute detail is desired.

Granger has divided his book into two main parts, with 113 illustrations, many of them having four, five or more pictures.

The normal structure is clearly shown and pathological conditions compared to the normal in such a way that one may easily visualize the diseased area. In many cases the author supplies the clinical history to explain the pathological plates. This book should be in the library of every otolaryngologist. M. F.

Plastic Surgery of the Nose, Ear and Face. By Victor Frühwald, M.D., Translated by Geoffrey Morey, M.D., B.S. With 86 pages and 88 illustrations. Vienna: Wilhelm Maudrich, 1932. Price \$4.00.

The author first gives a brief outline of the anatomy of the parts involved. An interesting part of his preparation for plastic operations is a series of photographs showing the condition as it is and another, retouched by the photographer, to show the change that may be expected after operation. In this way he avoids later arguments and discussion on the part of the patient insofar as the patient has had a chance to decide for himself whether or not he desires a plastic operation.

Frühwald uses local anesthesia in the vast majority of his work, although some of the more extensive bony operations are done under general.

The illustrations are well done and serve to explain the points which the author wishes to emphasize. Operations for the correction of various nasal deformities are gone into individually and the technique outlined. M. F.

